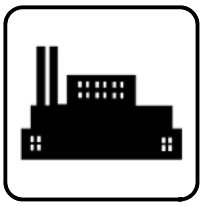
Operation

Industrial Generator Sets



Models:

400-1300 kW

Controller:
Decision-Maker® 8000

KOHLER®

TP-6990 8/18b

⚠ WARNING: This product can expose you to chemicals, including carbon monoxide and benzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm.
For more information go to www.P65warnings.ca.gov

Product Identification Information

Product identification numbers determine service parts. Record the product identification numbers in the spaces below immediately after unpacking the products so that the numbers are readily available for future reference. Record field-installed kit numbers after installing the kits.

Generator Set Identification Numbers

Record the product identification numbers from the generator set nameplate(s).

Model Designation _____

Specification Number _____

Serial Number _____

Accessory Number	Accessory Description

Controller Identification

Record the controller description from the generator set operation manual, spec sheet, or sales invoice.

Controller Description _____

Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

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Table of Contents, continued

IMPORTANT SAFETY INSTRUCTIONS. Electromechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. SAVE THESE INSTRUCTIONS.

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.

DANGER

Danger indicates the presence of a hazard that ***will cause severe personal injury, death***, or ***substantial property damage***.

WARNING

Warning indicates the presence of a hazard that ***can cause severe personal injury, death,*** or ***substantial property damage***.

CAUTION

Caution indicates the presence of a hazard that ***will*** or ***can cause minor personal injury*** or ***property damage***.

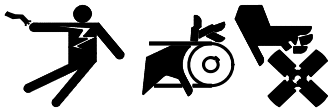
NOTICE

Notice communicates installation, operation, or maintenance information that is safety related but not hazard related.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

Accidental Starting

WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual-Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

Battery

WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

WARNING

Explosion.
Can cause severe injury or death.
Relays in the battery charger cause arcs or sparks.

Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.

Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery. Never connect the negative (–) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

Engine Backfire/Flash Fire

⚠ WARNING

Risk of fire.
Can cause severe injury or death.

Do not smoke or permit flames or sparks near fuels or the fuel system.

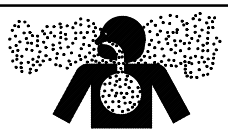
Servicing the fuel system. A flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the carburetor, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Catch fuels in an approved container when removing the fuel line or carburetor.

Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner removed.

Combustible materials. A fire can cause severe injury or death. Generator set engine fuels and fuel vapors are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the compartment or nearby area with a fully charged fire extinguisher. Select a fire extinguisher rated ABC or BC for electrical fires or as recommended by the local fire code or an authorized agency. Train all personnel on fire extinguisher operation and fire prevention procedures.

Exhaust System

⚠ WARNING



Carbon monoxide.
Can cause severe nausea, fainting, or death.

The exhaust system must be leakproof and routinely inspected.

Generator set operation. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Avoid breathing exhaust fumes when working on or near the generator set. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate the generator set where exhaust gas could accumulate and seep back inside a potentially occupied building.

Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning symptoms include but are not limited to the following:

- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles
- Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision
- Stomachache, vomiting, nausea

If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve within minutes of breathing fresh air.

Do not use copper tubing in diesel exhaust systems. Sulfur in diesel exhaust causes rapid deterioration of copper tubing exhaust systems, resulting in exhaust leakage.

Fuel System

⚠ WARNING

Explosive fuel vapors.
Can cause severe injury or death.

Use extreme care when handling, storing, and using fuels.

The fuel system. Explosive fuel vapors can cause severe injury or death. Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks. Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid fuel line breakage caused by vibration. Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.

Explosive fuel vapors can cause severe injury or death. Take additional precautions when using the following fuels:

Propane (LPG)—Adequate ventilation is mandatory. Because propane is heavier than air, install propane gas detectors low in a room. Inspect the detectors per the manufacturer's instructions.

Natural Gas—Adequate ventilation is mandatory. Because natural gas rises, install natural gas detectors high in a room. Inspect the detectors per the manufacturer's instructions.

Draining the fuel system. Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining the fuel system. Wipe up spilled fuel after draining the system.

Gas fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LPG vapor or natural gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to 6–8 ounces per square inch (10–14 inches water column). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

LPG liquid withdrawal fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LPG liquid withdrawal fuel system for leakage by using a soap and water solution with the fuel system test pressurized to at least 90 psi (621 kPa). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

Hazardous Noise

⚠ CAUTION

Hazardous noise.
Can cause hearing loss.

Never operate the generator set without a muffler or with a faulty exhaust system.

Engine noise. Hazardous noise can cause hearing loss. Generator sets not equipped with sound enclosures can produce noise levels greater than 105 dBA. Prolonged exposure to noise levels greater than 85 dBA can cause permanent hearing loss. Wear hearing protection when near an operating generator set.

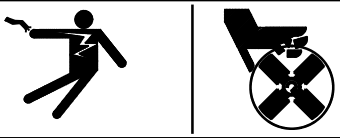
Hazardous Voltage/ Moving Parts

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER



Hazardous voltage. Moving parts.
Will cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

⚠ WARNING

Hazardous voltage.
Backfeed to the utility system can cause property damage, severe injury, or death.

If the generator set is used for standby power, install an automatic transfer switch to prevent inadvertent interconnection of standby and normal sources of supply.

Grounding electrical equipment. Hazardous voltage will cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

High voltage test. Hazardous voltage will cause severe injury or death. Follow the instructions of the test equipment manufacturer when performing high-voltage tests on the rotor or stator. An improper test procedure can damage equipment or lead to generator set failure.

Installing the battery charger. Hazardous voltage will cause severe injury or death. An ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

Connecting the battery and the battery charger. Hazardous voltage will cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Short circuits. Hazardous voltage/current will cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Engine block heater. Hazardous voltage will cause severe injury or death. The engine block heater can cause electrical shock. Remove the engine block heater plug from the electrical outlet before working on the block heater electrical connections.

Handling the capacitor. Hazardous voltage can cause severe injury or death. Electrical shock results from touching the charged capacitor terminals. Discharge the capacitor by shorting the terminals together.
(Capacitor-excited models only)

Electrical backfeed to the utility. Hazardous backfeed voltage can cause severe injury or death. Install a transfer switch in standby power installations to prevent the connection of standby and other sources of power. Electrical backfeed into a utility electrical system can cause severe injury or death to utility personnel working on power lines.

Testing live electrical circuits. Hazardous voltage or current will cause severe injury or death. Have trained and qualified personnel take diagnostic measurements of live circuits. Use adequately rated test equipment with electrically insulated probes and follow the instructions of the test equipment manufacturer when performing voltage tests. Observe the following precautions when performing voltage tests: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Do not touch the enclosure or components inside the enclosure. (4) Be prepared for the system to operate automatically.
(600 volts and under)

Servicing the generator set when it is operating. Exposed moving parts will cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Heavy Equipment

⚠ WARNING

Unbalanced weight.
Improper lifting can cause severe injury or death and equipment damage.

Do not use lifting eyes.
Lift the generator set using lifting bars inserted through the lifting holes on the skid.

Hot Parts

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.

⚠ WARNING

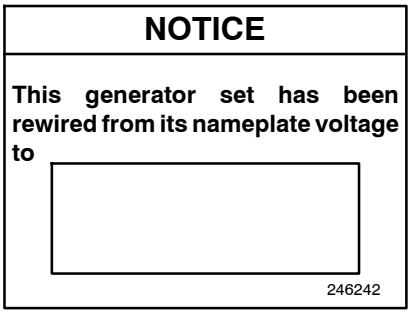
Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the alternator. Hot parts can cause severe injury or death. Avoid touching the alternator field or exciter armature. When shorted, the alternator field and exciter armature become hot enough to cause severe burns.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

Notice



NOTICE

Voltage reconnection. Affix a notice to the generator set after reconnecting the set to a voltage different from the voltage on the nameplate. Order voltage reconnection decal 246242 from an authorized service distributor/dealer.

NOTICE

Canadian installations only. For standby service connect the output of the generator set to a suitably rated transfer switch in accordance with Canadian Electrical Code, Part 1.

Notes

This manual provides operation instructions for generator sets equipped with the Decision-Maker® 8000 controller.

Wiring diagram manuals are available separately. Refer to the engine operation manual for generator set engine scheduled maintenance information.

Information in this publication represents data available at the time of print. Kohler Co. reserves the right to change this publication and the products represented without notice and without any obligation or liability whatsoever.

Read this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section at the beginning of this manual. Keep this manual with the equipment for future reference.

The equipment service requirements are very important to safe and efficient operation. Inspect the parts often and perform required service at the prescribed intervals. Maintenance work must be performed by appropriately skilled and suitably trained maintenance personnel familiar with generator set operation and service.

The disk supplied with this generator set is a backup copy of the generator set personality program containing data specific to the engine and alternator. The engine and alternator data was preprogrammed in the controller at the factory and no further use of the disk should be necessary. Typically, your authorized distributor stores this disk for possible future use such as controller replacement or other circumstances requiring a backup.

Abbreviations

This publication makes use of numerous abbreviations. Typically, the word(s) are spelled out along with the abbreviation in parentheses when shown for the first time in a section. Appendix A, Abbreviations, also includes many abbreviation definitions.

List of Related Materials

Figure 1 lists the available literature part numbers.

Communication and Software Manual Description	Literature Part No.
Controller Spec Sheet	G6-147
Generator Set/Controller Wiring Diagram Manual	TP-6994
Decision-Maker® 8000 Service Manual	TP-7011
InteliMonitor Software Manual	TP-7012
WebSupervisor Software Manual	TP-7013
Engine Operation Manual	
SFGLD240 (Standby/Prime)	TP-7019
SFGLD240 (Continuous)	TP-7020
SFGLD360 (Standby/Prime)	TP-6991
SFGLD360 (Continuous)	TP-7020
SFGLD480 (Standby/Prime)	TP-6991
SFGLD480 (Continuous)	TP-7020
SFGLD560 (Continuous)	TP-7020
HGM560 (Continuous)	TP-7021
Engine Installation Manual	
SFGLD240 (Standby/Prime)	TP-6995
SFGLD360 (Standby/Prime)	TP-6995
SFGLD480 (Standby/Prime)	TP-6995
SFGLD560 (Continuous)	TP-7022
HGM560 (Continuous)	TP-7023
Engine Parts Catalog	
SFGLD240	TP-7016
SFGLD360	TP-6997
SFGLD480	TP-6996
SFGLD560	TP-7017
HGM560	TP-7018
Generator Set Installation Manual	TP-5700
Battery Charger Operation Manual	TP-7025
Generator Set Parts Catalog	TP-7024
Digital Voltage Regulator Installation, Operation, and Service Manual	TP-6821
Alternator Maintenance Manual	TP-5578
Alternator Service Manual	TP-6373
Modbus® Communications Protocol Operation Manual	TP-6113

Figure 1 Related Literature

Modbus® is a registered trademark of Schneider Electric.

Service Assistance

For professional advice on generator set power requirements and conscientious service, please contact your nearest Kohler distributor or dealer.

- Visit the Kohler Co. website at KOHLERPower.com.
- Look at the labels and decals on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

Headquarters Europe, Middle East, Africa (EMEA)
Kohler EMEA Headquarters
Netherlands B.V.
Kristallaan 1
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China
North China Regional Office, Beijing
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(86) 10 6518 7951
(86) 10 6518 7952
Fax: (86) 10 6518 7955

East China Regional Office, Shanghai
Phone: (86) 21 6288 0500
Fax: (86) 21 6288 0550

India, Bangladesh, Sri Lanka
India Regional Office
Bangalore, India
Phone: (91) 80 3366208
(91) 80 3366231
Fax: (91) 80 3315972

Japan, Korea
North Asia Regional Office
Tokyo, Japan
Phone: (813) 3440-4515
Fax: (813) 3440-2727

1.1 Introduction

The Decision-Maker® 8000 combines a 203 mm (8 inch) color display with intuitive navigation and quick access buttons. The Decision-Maker® 8000 also provides extensive metering and monitoring options, visual charting capabilities, advanced control, system monitoring, system diagnostics, and control for paralleling multiple generator sets.

The Decision-Maker® 8000 interfaces the generator set to other power system equipment and other network management systems using standard industry network communications.

The spec sheets for each generator set provide model-specific generator set and engine information. The controller spec sheet provides specifications for this controller. Refer to the respective spec sheets for data not supplied in this manual. Consult the generator set service manual, installation manual, and engine operation manual for additional specifications.

Note: Paralleling features or functions mentioned in this manual are only available when the generator set is ordered with paralleling options.

Decision-Maker® 8000 features include:

- Communication with RS-232 and RS-485 and Ethernet (RJ-45)
- Supports Modbus® RTU, Modbus® TCP, and SNMP version 1 protocols
- Stores up to 4000 records in Event History
- Snap shot capabilities store up to 50 pre-alarm records prior to shutdown
- Data logging and trending of various customizable data outputs for easy troubleshooting
- USB connection port to assist with data storage
- 8 digital inputs and 8 digital outputs for customer connections

Paralleling controller features include:

- Supports paralleling up to 32 generator sets (with optional paralleling kit)
- Digital isochronous load sharing with other Decision-Maker® 8000 controller equipped generator sets

1.2 Controller Specifications

Decision-Maker® 8000 Controller	
Power source	8-36 volt DC
Power drain	150 milliamps at 24V
Humidity range	Up to 95% non condensing
Operating temperature	–20° to 70°C (–4° to 158°F)
Storage temperature	–30° to 80°C (–22° to 176°F)

Figure 1-1 Decision-Maker® 8000 Specifications

Note: Have setup and adjustments of the Decision-Maker® 8000 controller performed only by an authorized Kohler distributor. Some settings and adjustments are password protected.

Modbus® is a registered trademark of Schneider Electric.

1.3 Application Description

The Decision-Maker® 8000 operation is intended for sites where up to 32 generator sets work in parallel. The main operation features are as follows:

- Automatic start-up and stop sequences with adjustable timing
- Wide range of generator set and engine protections and additional freely configurable protections
- Multiple island operation with digital active and reactive load sharing
- One breaker control (GCB) including synchronizing to the busbar
- Soft loading and unloading
- Power management — automatic starting and stopping of generator set according to the load demand, running hours equalization, and other optimization features

Note: Paralleling operation requires a paralleling option for each generator set in service.

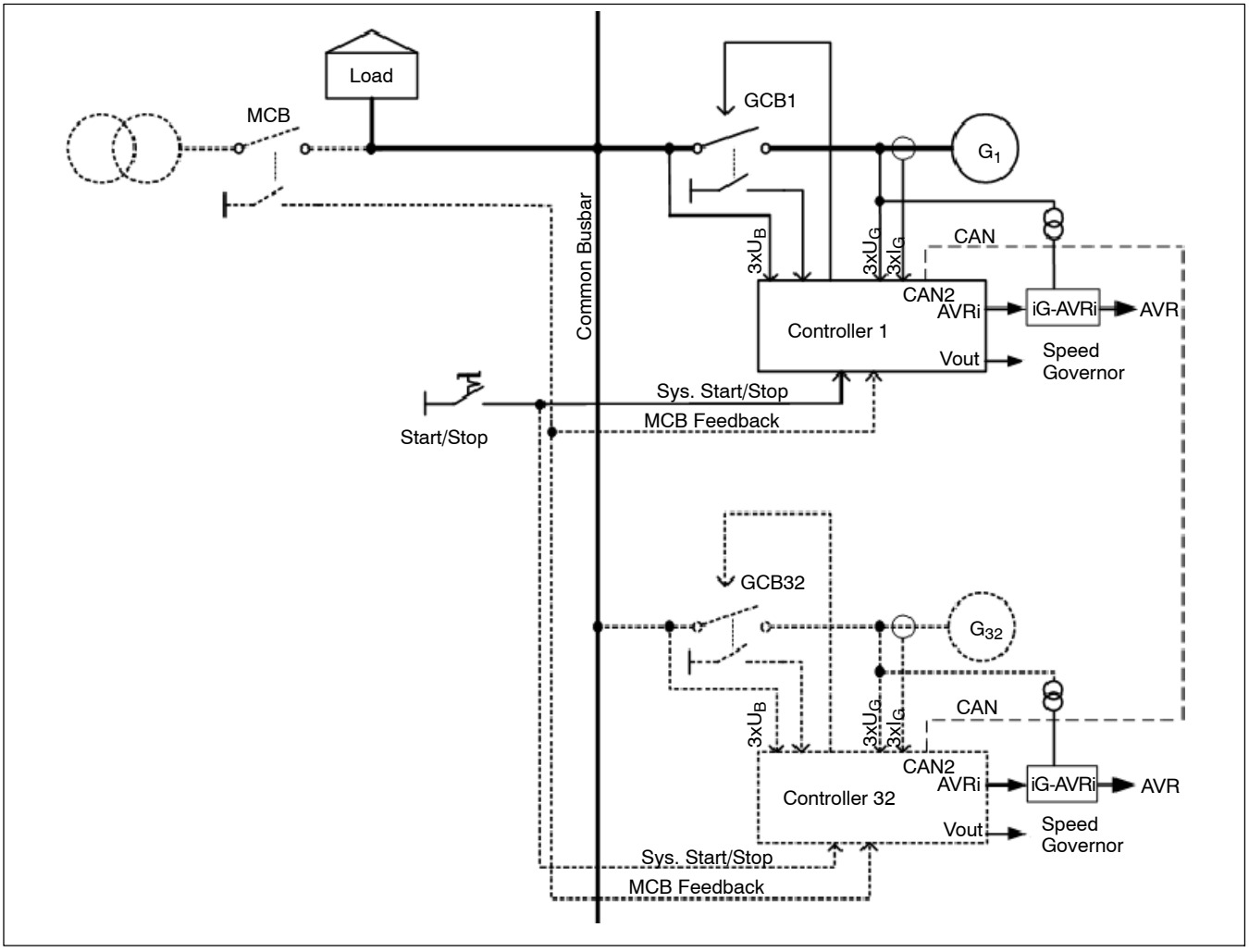


Figure 1-2 Decision-Maker® 8000 Operation (Standby and Prime Applications)

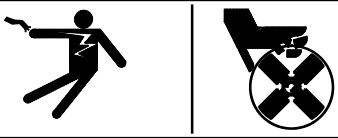
1.4 Control Panel and Component Overview

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER



Hazardous voltage. Moving parts.
Will cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

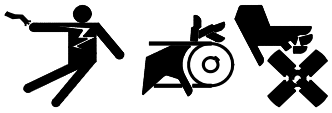
⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

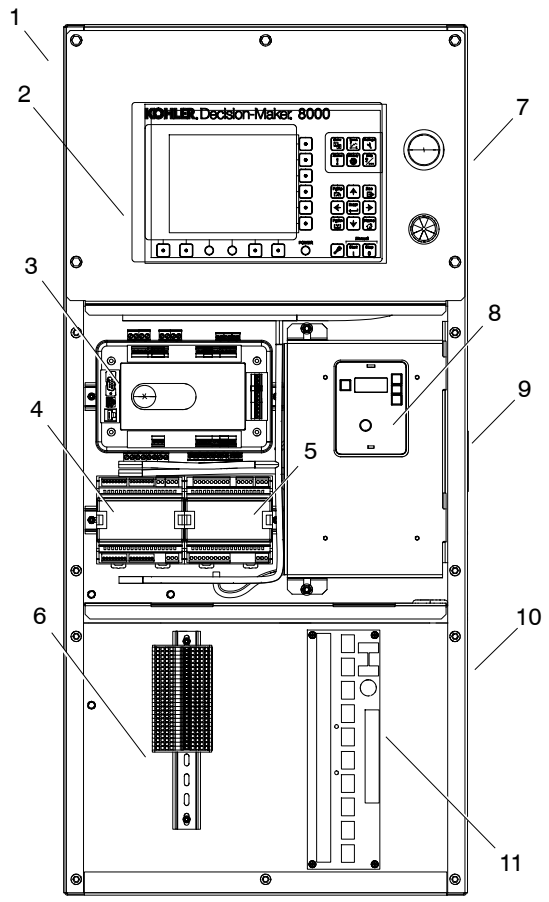
Disconnect the battery cables before working on the generator set. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

The control panel contains the key components for monitoring and operating the generator set such as the Decision-Maker® 8000, the Automatic Voltage Regulator (AVR), and the customer connection contacts.

The control panel is divided into three compartments: the top compartment contains the display unit; the middle compartment contains the base box, analog input module, input/output module, and automatic voltage regulator (AVR); and the bottom compartment contains the customer connection contacts on terminal block 1 and the dry contact board. See Figure 1-3 and Figure 1-6 for component location.



1. Control panel
2. Controller display
3. Base box
4. AIN8 module
5. IO8/8 module
6. Dry contact board
7. Top panel
8. Voltage regulator
9. Middle (high voltage) panel
10. Bottom panel
11. Customer connections

Figure 1-3 Control Panel (compartment covers removed)

1.4.1 Controller Display Unit (CDU)

The controller display provides generator set monitoring and operation and is the main component for navigation and user interaction. The display is located in the upper compartment of the generator set control panel and is connected to the controller base box.

1.4.2 Controller Base Box

All of the main electronic components of the engine, generator set, and alternator connect to and communicate with the controller base box. The base box monitors and controls the generator set through communication with the engine electronic control unit (ECU), the ignition system (GIS), and the automatic voltage regulator (AVR). The base box uses this communication to provide information and content to the user through the controller display.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

1.4.3 Input/Output Module

The input/output module provides analog outputs and binary inputs and outputs. These inputs and outputs are connected to the customer connection terminal block in the control panel bottom compartment. The input/output module communicates with the base box through CAN communication.

1.4.4 Analog Input Module

The analog input module provides analog input connections for sensors like the coolant temperature sender, oil pressure sender, oil temperature sender, ambient air temperature sender, intake manifold temperature sender, and the exhaust thermocouples. The analog input module receives signals from these sensors and relays this information to the controller base box through CAN communication.

1.4.5 Automatic Voltage Regulator (AVR)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

The automatic voltage regulator is a control device that regulates the output voltage of the alternator by controlling the current into the exciter field and the reactive power (VAR) supplied by the generator set. Input power to the AVR is derived from a single phase permanent magnet generator (PMG exciter).

See the voltage regulator user manual (Figure 1, List of Related Materials) for voltage regulation operation and maintenance.

1.4.6 Customer Connections

Customer connections and accessories connect to either the customer connection terminal or the dry contact board located in the bottom compartment of the control panel. See Figure 1-3

Use the customer connection terminal block for signals such as remote start/stop, binary inputs and accessories such as remote emergency stop. The customer connection terminal block also contains inputs for breaker position and CAN communication with other Decision-Maker® 8000 controllers.

The dry contact board contains designated relay connections for accessories, kits, and alarms such as a run relay, high coolant temperature alarm, overspeed alarm, and radiator fan control connections.

See Section 9 for accessory information.

1.4.7 Junction Box

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Circuit breakers and electrical connections are typically located inside the junction box. See Figure 1-4 for the junction box location on the generator set.

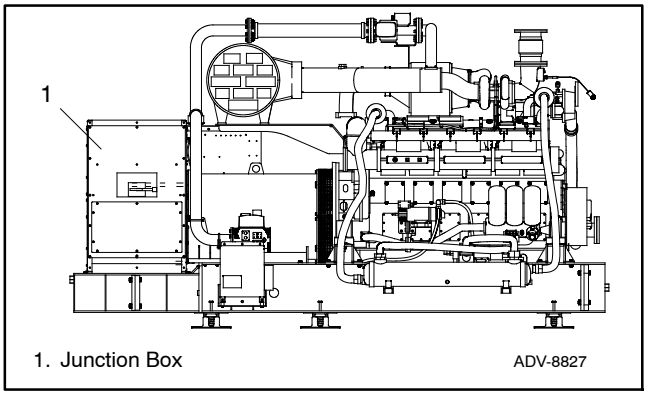
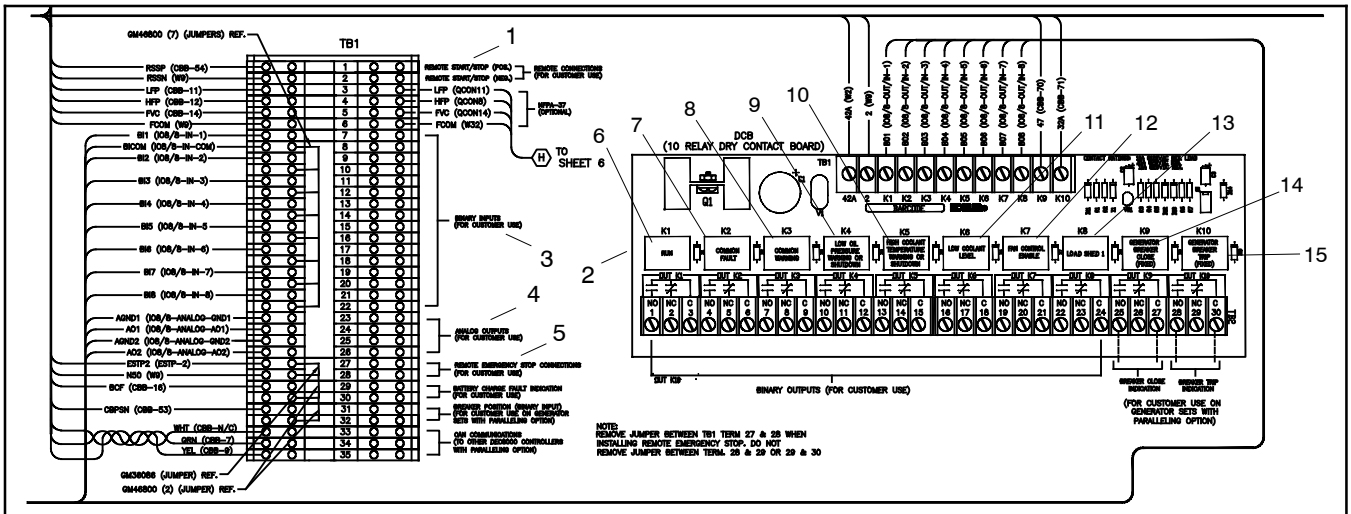


Figure 1-4 Junction Box Location



1. Remote start/stop
2. Dry contact board
3. Binary inputs
4. Analog outputs
5. Remote emergency stop
6. Run relay
7. Common fault relay
8. Common warning relay
9. Low oil pressure warning or shutdown relay
10. High coolant temperature warning or shutdown relay
11. Low coolant level relay
12. Fan control enable relay
13. Load Shed relay
14. Generator breaker close relay
15. Generator breaker trip relay

Figure 1-5 Customer Connections Diagram

1.5 Decision-Maker 8000

The Decision-Maker® 8000 consists of four main components:

- Controller Display Unit (CDU) – Provides visual display, controller navigation buttons, and operation buttons.
- Controller base box – Provides generator set control and monitoring through communication with the engine, ignition system, and voltage regulator.
- Input/Output Module – Provides binary input and output and analog output connections.
- Analog Input Module – Provides analog input connections.

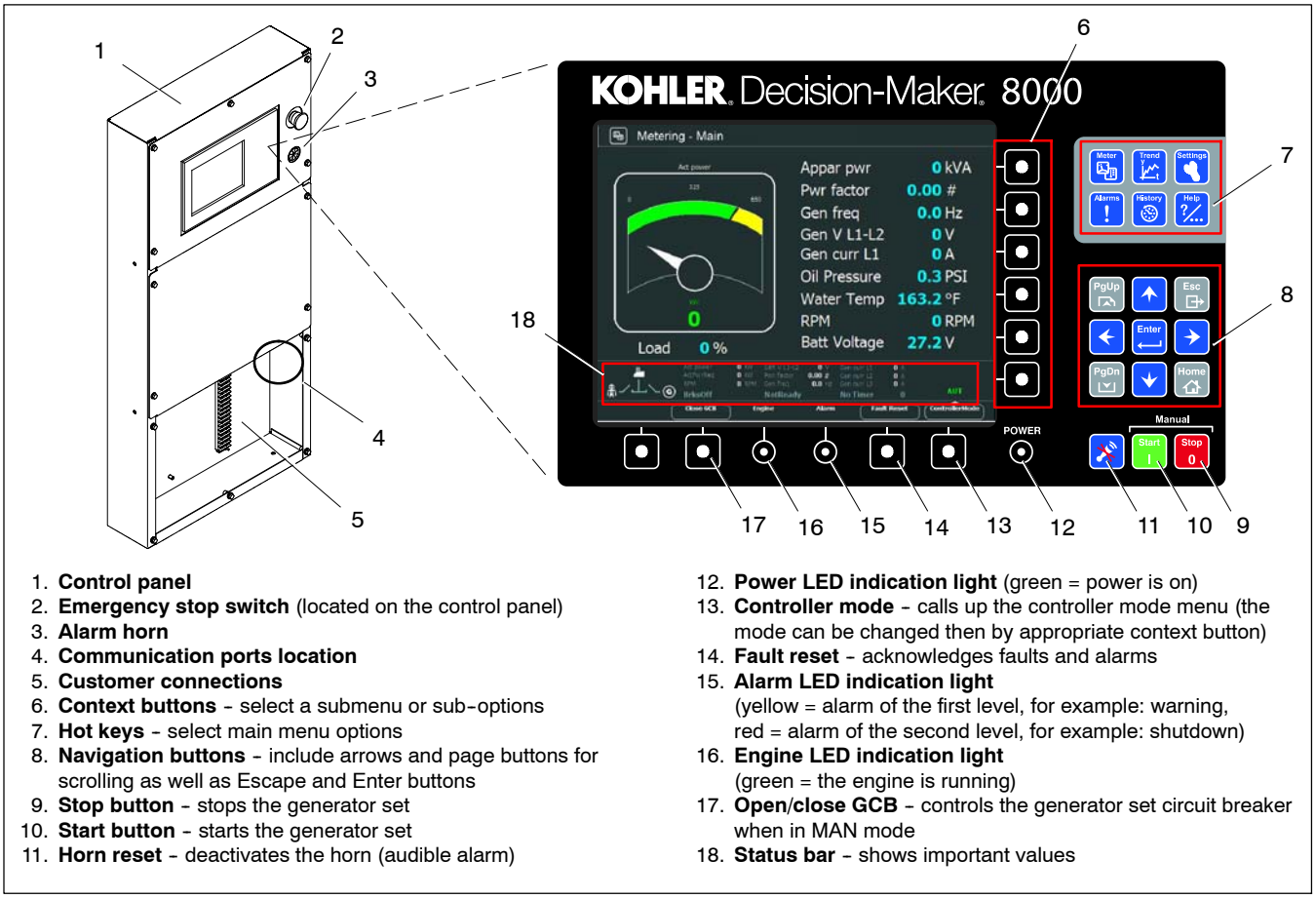
1.5.1 Controller Display Unit (CDU)

The controller contains both an 800 x 600 pixel display for monitoring the generator set and controller buttons for controlling the generator set and screen navigation.

The display shows multiple monitoring screens for engine data, system status, as well as event history, Trends monitoring, and an easily accessible alarm list. See Figure 1-6. The graphical display shows abbreviations in some instances.

The display features numerous adjustable settings such as brightness, back-light time, date, language and user passwords. To adjust the display settings, see Sections 2.3 and 2.10.

The generator set must be running for some metering values to be indicated. If the generator set is not running, these values will display a zero.



1. **Control panel**
2. **Emergency stop switch** (located on the control panel)
3. **Alarm horn**
4. **Communication ports location**
5. **Customer connections**
6. **Context buttons** – select a submenu or sub-options
7. **Hot keys** – select main menu options
8. **Navigation buttons** – include arrows and page buttons for scrolling as well as Escape and Enter buttons
9. **Stop button** – stops the generator set
10. **Start button** – starts the generator set
11. **Horn reset** – deactivates the horn (audible alarm)
12. **Power LED indication light** (green = power is on)
13. **Controller mode** – calls up the controller mode menu (the mode can be changed then by appropriate context button)
14. **Fault reset** – acknowledges faults and alarms
15. **Alarm LED indication light** (yellow = alarm of the first level, for example: warning, red = alarm of the second level, for example: shutdown)
16. **Engine LED indication light** (green = the engine is running)
17. **Open/close GCB** – controls the generator set circuit breaker when in MAN mode
18. **Status bar** – shows important values

Figure 1-6 Control Panel and Decision-Maker® 8000 Controller

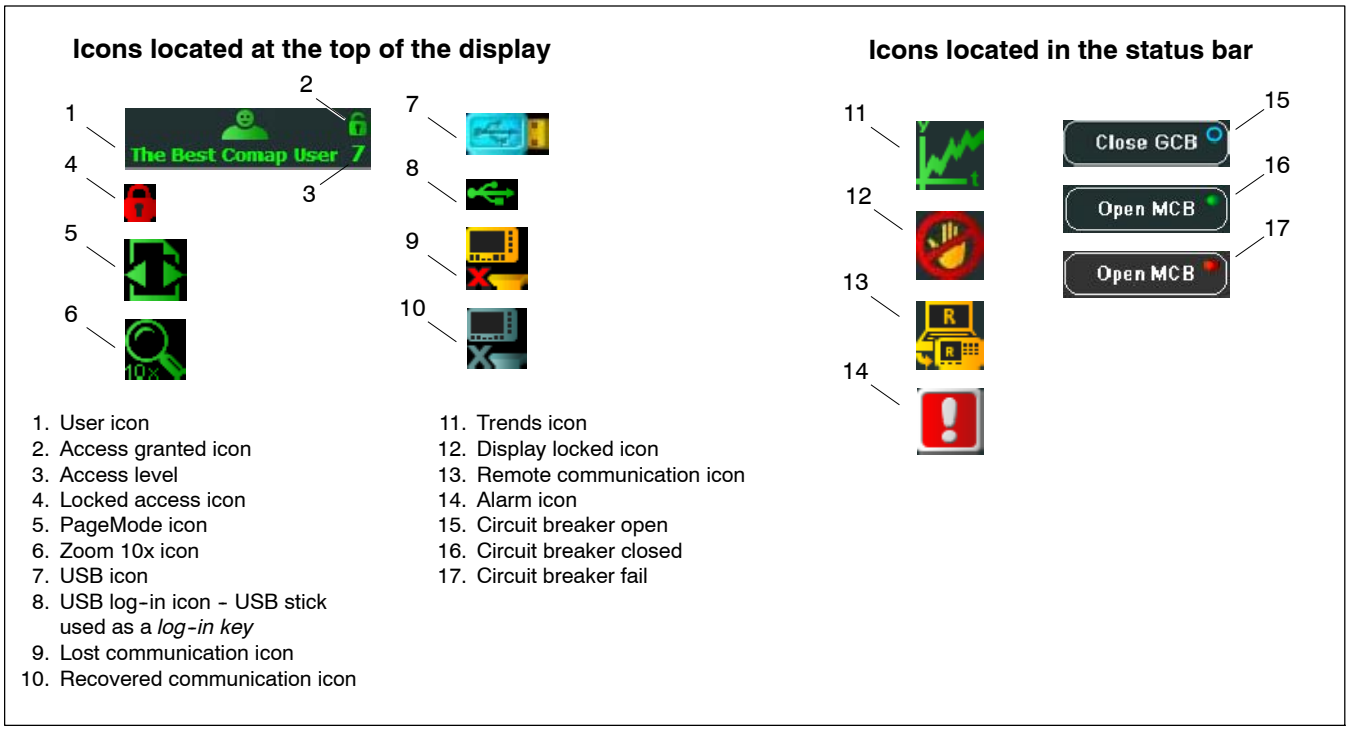


Figure 1-7 Controller Icon Descriptions

Status Bar

The status bar is always active and visible on each screen. Located at the bottom of the display, the status bar shows a summary of the most commonly accessed generator set values such as engine speed, power, voltage, current, and frequency. Besides values, the status bar shows status icons for load and generator set power sources, circuit breakers, communication, and alarms. See Figure 1-6, Figure 1-7, and Figure 1-8.

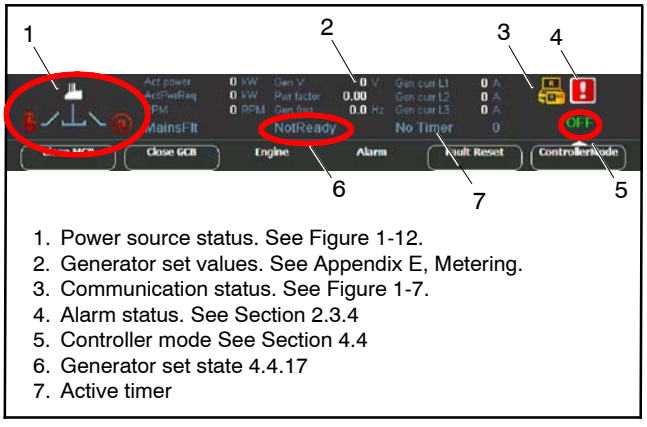


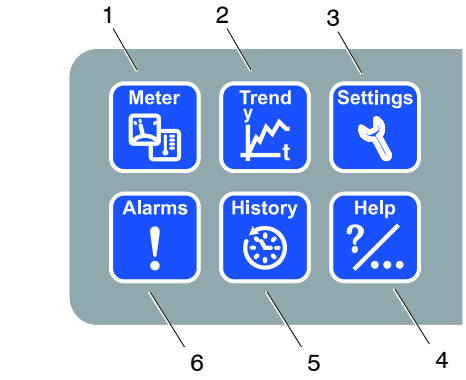
Figure 1-8 Status Bar

1.5.2 Controller Buttons

The Decision-Maker® 8000 has twenty-eight buttons that enable the user to operate the generator set, to quickly navigate from screen to screen, and to select and change generator settings. The controller interface groups navigation and operation buttons according to function. See Figure 1-6.

Hot Keys

The six hot keys on the display allow the user to quickly navigate to any one of the six main menu screens. See Figure 1-9.



1. Metering
2. Trends
3. Setpoints
4. Alarms
5. History
6. Help/Others

Figure 1-9 Hot Keys

Metering (Measurement) Button:

- Jumps to the last selected Metering screen.
- Activates and deactivates the menu for the context sensitive buttons.
- See Section 2.5.

Trends Button:

- Jumps to the Trends screen.
- Activates and deactivates the menu for the context sensitive buttons.
- See Section 2.6

Settings (Setpoint) Button:

- Jumps to the last selected Setpoint screen.
- Activates and deactivates the menu for the context sensitive buttons.
- See Section 2.7

Alarms Button:

- Jumps to the AlarmList screen.
- See Section 2.8

History Button:

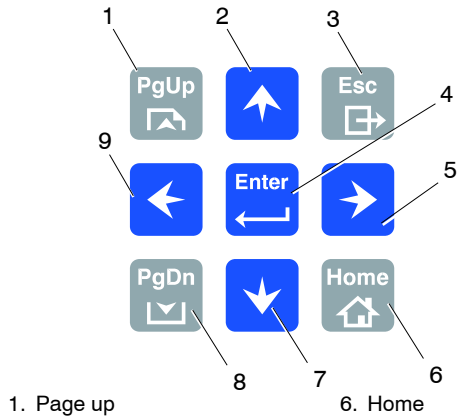
- Jumps to the last selected position in the History screen.
- Activates and deactivates the menu for the context sensitive buttons.
- See Section 2.9

Help/Others Button:

- Jumps to the last selected Help screen.
- Activates and deactivates the menu for the context sensitive buttons.
- See Section 2.10

Navigation Buttons

The nine navigation buttons allow the user to scroll through menus, to make selections, and to change settings. See Figure 1-10.



1. Page up
2. Up scroll arrow
3. Escape
4. Enter or select
5. Right scroll arrow
6. Home
7. Down scroll arrow
8. Page Down
9. Left scroll arrow

Figure 1-10 Navigation Buttons

Home Button:

- Jump to the Home screen (Main Metering screen).

Escape Button:

- Escapes or cancels a dialog box.
- Deactivates a context menu.
- To open the Brightness dialog box, press either the **Up** or **Down** navigation button while pressing and holding the **Escape** button.

Enter Button:

- Opens a value adjustment for editing.
- Confirms a value.

Up Button:

- Scrolls or moves cursor up to the next selection in the Metering and Setpoint context menus when the context menu is active.
- Scrolls or moves cursor up to the next selection in a list of setpoints or history records when the context menu is inactive.
- Increases the value in a dialog box.

Down Button:

- Scrolls or moves cursor down to the next selection in the Metering and Setpoint context menus when the context menu is active.
- Scrolls or moves cursor down to the next selection in a list of setpoints or history records when the context menu is inactive.
- Decreases the value in a dialog box

Left Button:

- Scrolls or moves cursor left to the next selection in a list of history records or a dialog box.

Right Button:

- Scrolls or moves cursor right to the next selection in a list of history records or a dialog box.

Page Up Button:

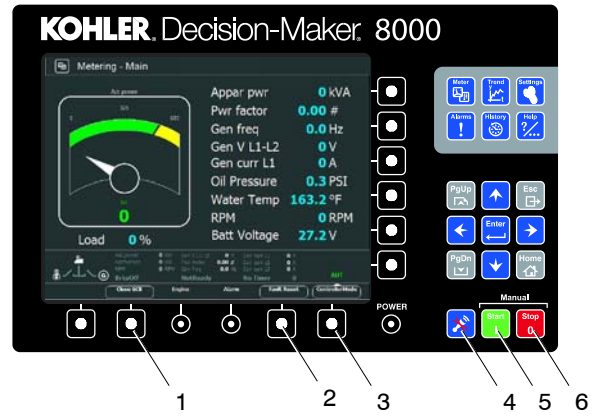
- Scrolls to the previous page in a context menu when the context menu is active.
- Scrolls to the previous page in a list of setpoints or history records when the context menu is inactive.

Page Down Button:

- Scrolls to the next page in a context menu when the context menu is active.
- Scrolls to the next page in a list of setpoints or history records when the context menu is inactive.

Operation Buttons

The operation buttons allow the user to operate the generator set, change the controller mode, reset faults, and silence alarms. See Figure 1-11.

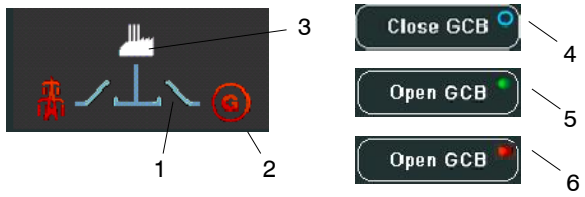


1. Open/close GCB
2. Fault reset
3. Controller mode
4. Horn reset
5. Start button
6. Stop button

Figure 1-11 Operation Buttons

Open/Close GCB:

If a motorized circuit breaker is included, the Open/Close GCB button controls the Generator Circuit Breaker (GCB). Pressing the Open/Close GCB button while in MAN mode opens and closes the GCB when the conditions are safe for closing the breaker to the bus. The status of the circuit breaker is displayed on the status bar and the Open/Close GCB button. See Figure 1-12.



1. Generator circuit breaker (if included)
2. Generator status icon
3. Load icon
4. Blue ringlet – Circuit breaker open
5. Green dot – Circuit breaker closed
6. Red dot – Circuit breaker fail

Figure 1-12 GCB Status

Fault Reset Button:

- Acknowledges alarms and changes status to *confirmed*.
- Removes inactive alarms.
- Deactivates the horn.

Controller Mode Selection Button:

- Activates the Mode context menu. See Section 4.4.

Horn Reset Button:

- Deactivates the horn without acknowledging the alarms.

Note: Although the horn is deactivated, the alarm is still active and unacknowledged in the Alarm List.

Start Button:

- Initiates the start sequence to run the generator set.
- Works only in MAN mode.

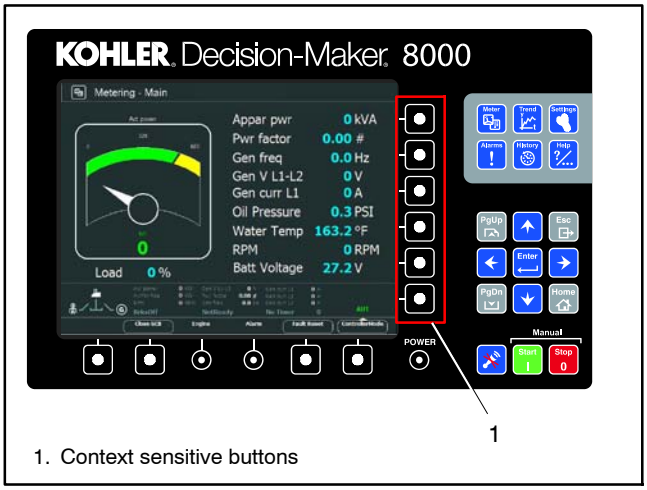
Stop Button:

- Initiates the stop sequence of a generator set.
- Pressing repeatedly or holding for more than 2 seconds cancels cooling phase of stop sequence.
- Works only in MAN mode.

Context Sensitive Buttons

The six context sensitive buttons can be used to navigate submenus and make selections in those menus. See Figure 1-13**.** The context sensitive buttons will change depending on which main menu is displayed. All context sensitive buttons essentially work the same way.

- Activate and deactivate a context menus.
- Select a specific item in the context menu.



1. Context sensitive buttons

Figure 1-13 Context Sensitive Buttons

1.5.3 LED Status Indication Lights

The controller has three LED status indication lights which visualize generator set status. See Figure 1-14 and Figure 1-15.

1. Engine LED indication light
2. Alarm LED indication light
3. Power LED indication light

Figure 1-14 Status Indication Light Locations

LED Light	Color
Power	power LED indication (green = power is on)
Alarm	yellow = alarm of the first level or warning, red = alarm of the second level or shutdown
Engine	engine LED indication (green = the engine is running)

Figure 1-15 Status Indication Lights

The following definitions describe the generator set status and what visual indicators to expect.

Power LED: Green light indicates that the controller has power.

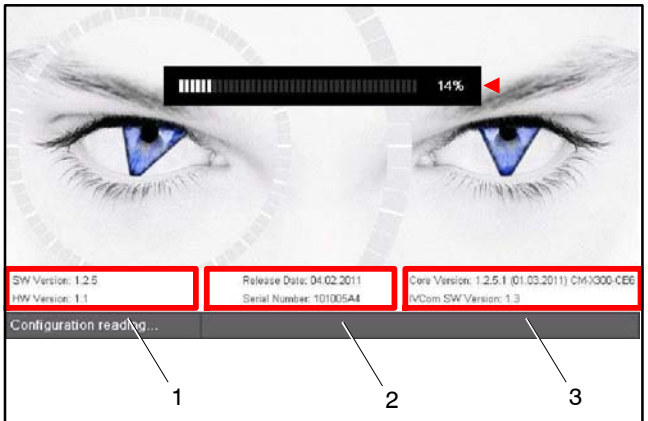
Engine LED: Green light indicates that the engine is running.

Alarm Indication LED Light: A yellow light indicates a level 1 alarm (warning) and a red light indicates a level 2 alarm (shutdown). The light flashes when a fault is unacknowledged and turns solid once the fault is acknowledged.

See Sections 4.4.14, 4.4.15, and Appendix D for alarm types and Appendix C for specific alarm definitions.

2.1 Connection Screen

Upon startup or configuration, the connection screen will display the configuration progress, software version, serial numbers, and display information. See Figure 2-1.



1. Software and hardware versions
2. Serial number and release date
3. Display information

Figure 2-1 Connection Screen Features

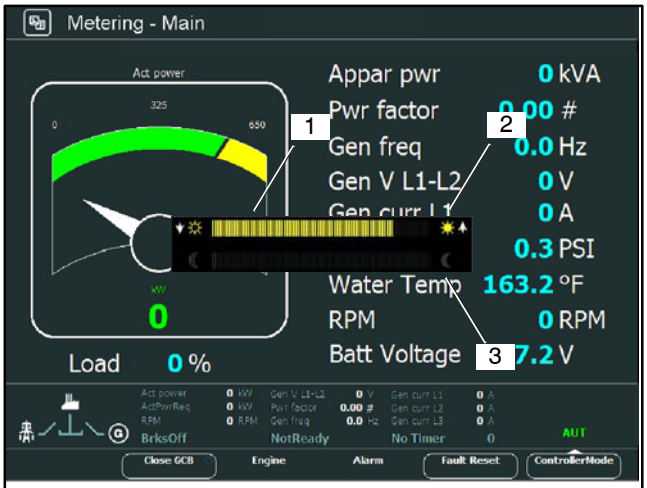
Note: If communication is lost during configuration, a red Timeout notification displays at the bottom of the screen and the communication window opens. See page 48 to correct the connection settings.

2.2 Screen Capture

To capture a screen for troubleshooting or analysis, insert a USB stick into the USB-A port and then simultaneously press and hold the **Left** and **Up** arrow buttons.

2.3 Brightness dialog screen.

The brightness setting for the display ranges from 0% to 100% and has two brightness modes, day mode and night mode. See Figure 2-2.



1. Brightness dialog box
2. Day mode
3. Night mode

Figure 2-2 Screen Brightness

2.3.1 Navigation - Brightness

- To open the Brightness dialog box, press either the **Up** or **Down** navigation button while pressing and holding the **Escape** button.
- To increase or decrease the Brightness level, press either the **Up** or **Down** navigation button while pressing and holding the **Escape** button.
- To select a brightness mode, use the **Page Up** and **Page Down** buttons.
- To toggle between day and night mode, press and hold the **Escape** button for 1 second.

2.4 Screens and Menus Overview

Each of the controller screens is covered in Section 2.4. This section on screens and menus explains the highlights and features of each screen, basic navigation, adjustments, and content.

Figure 2-3 provides an overview of the controller buttons. Use this reference to understand the menu layout of the Decision-Maker® 8000 and to quickly navigate to a desired menu.

Note: Use hot keys to navigate to a main menu screen and the context sensitive buttons to navigate the content menus.

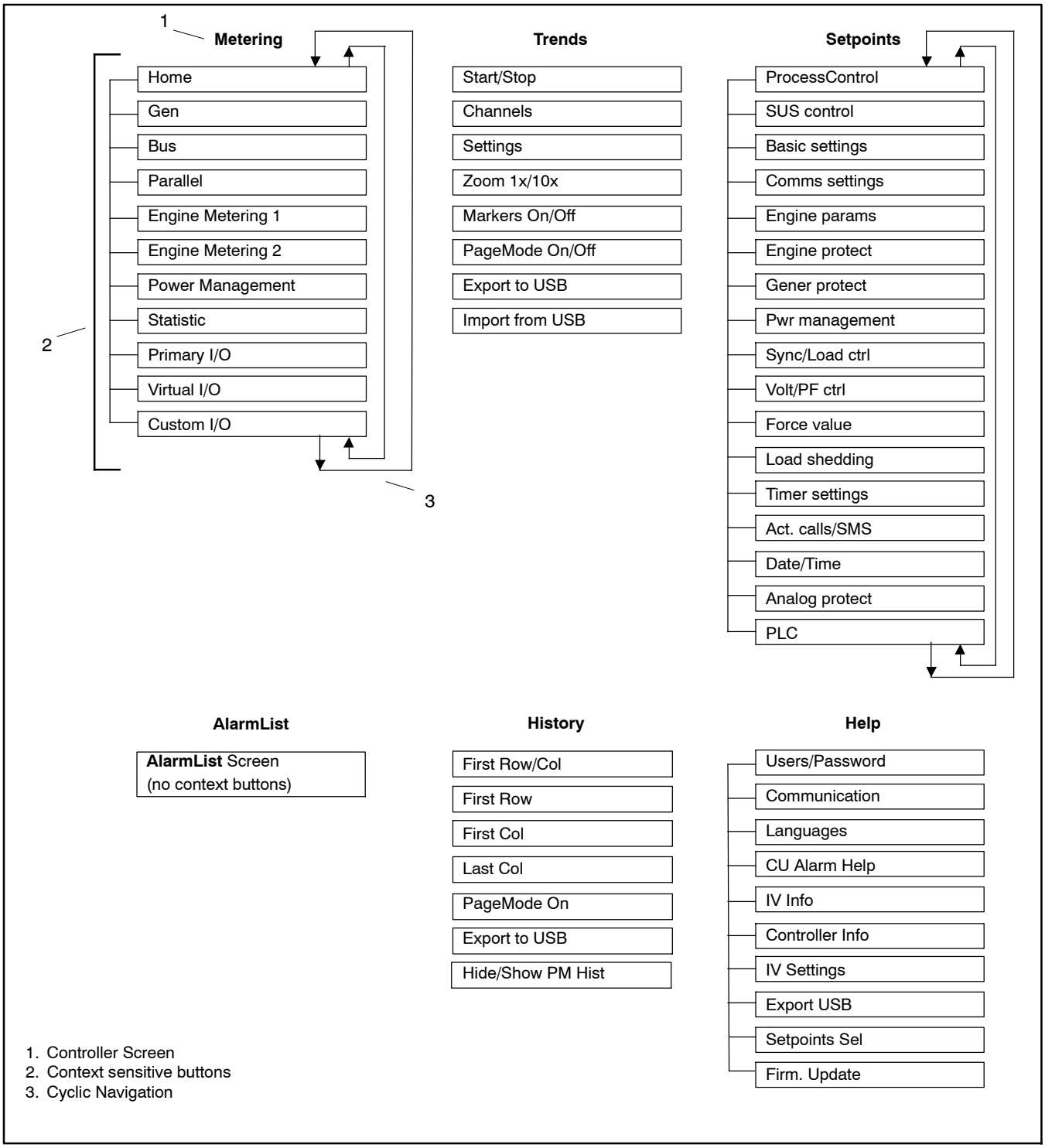


Figure 2-3 Controller Menu Overview

2.5 Metering

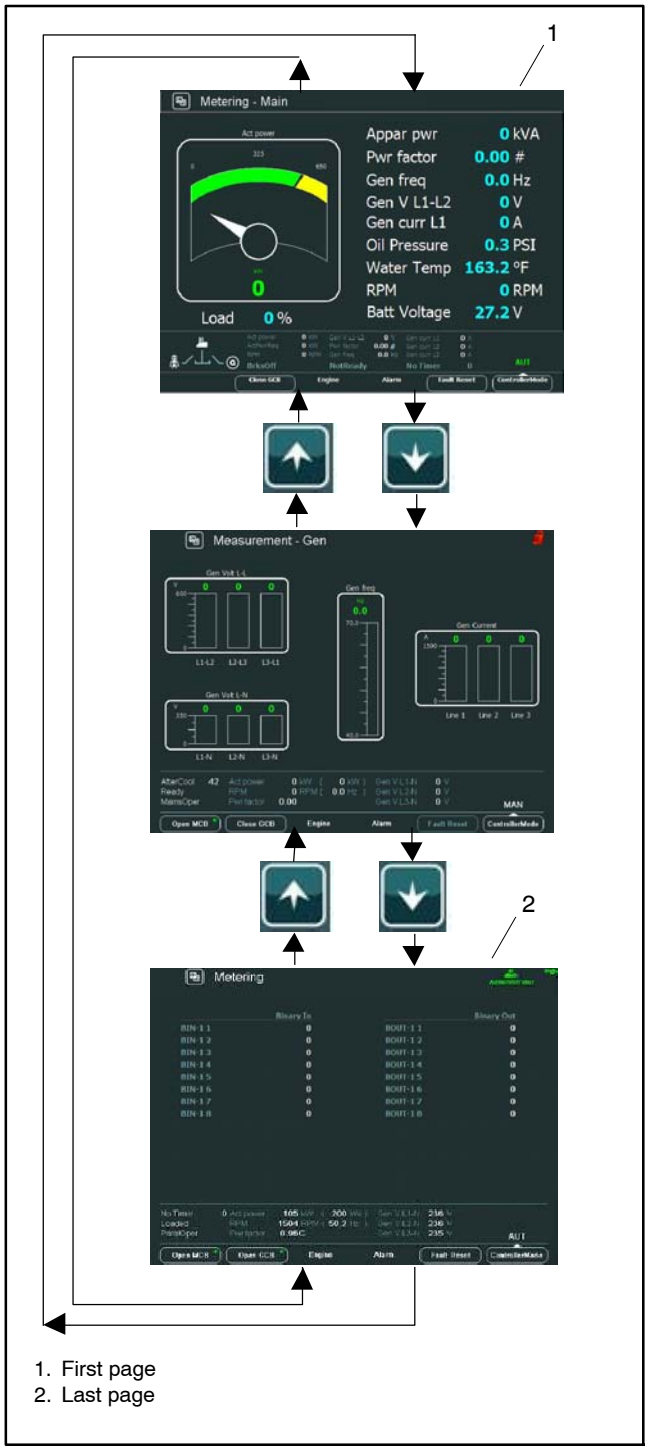
The metering screens provide numerous readouts, charts, and meters for monitoring the generator set, engine, binary inputs and outputs, and paralleling. These metering screens enhance the monitoring of the generator set performance with visual graphic displays and accessible menus.

The generator set and engine parameters are listed in Appendix E. See Figure 1 and Figure 2.

2.5.1 Navigation - Metering

- Use the **Home** button to go to the main or first metering screen.
- Use the **Meter** button to navigate back to the last metering screen that was accessed when viewing another menu such as Alarms or History.
- Use the **Meter** button to activate and deactivate the context menu.
- Use the **Context Sensitive** buttons to jump to a specific metering screen
- Use the **navigation arrow** buttons to scroll through each metering screen.

The page structure for the metering screens is cyclical. In a cyclical page structure, pressing the Down button on the last screen will navigate the user to the first page; pressing the Up button on the first page will navigate the user to the last page. See Figure 2-4.



1. First page
2. Last page

Figure 2-4 Metering Page Structure

2.5.2 Metering Screens

The following is a list of the metering screens available and a brief description of each screen. These screens can be accessed through the context sensitive buttons or by using the navigation arrows to scroll through the screens.

- **Home:** Provides readouts for generator set power, voltage, and current output, RPMs, oil pressure, and water temperature. A large meter provides a visualization of the kW readout. See Figure 2-5.

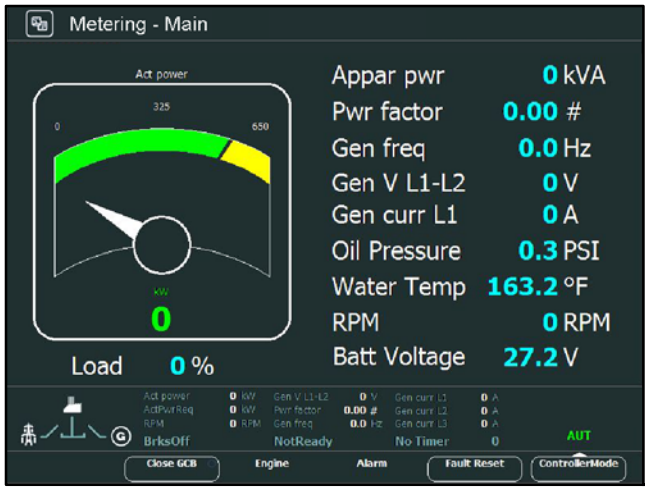


Figure 2-5 Home Screen

- **Gen:** Monitors alternator output for the Voltage, frequency, and Amperes. Bar charts allow the comparison of Voltage and Amperes by phase. See Figure 2-6.

Figure 2-6 Generator Screen

- **Bus:** Provides bus readouts for frequency, current, and line to line and line to neutral voltage. Bar graphs allow the comparison of Voltage by phase. See Figure 2-7.

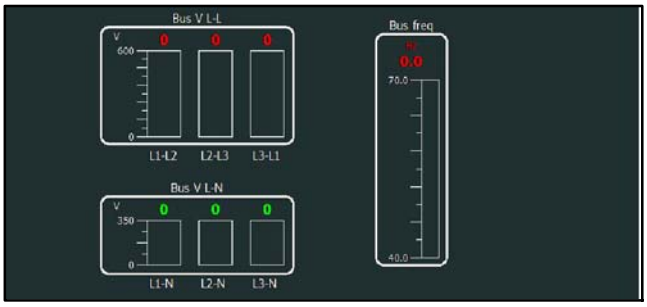


Figure 2-7 Bus Screen

- **Parallel:** Visualizes the synchronization of the generator set to the bus by displaying critical parameters. such as frequency, Voltage, and angle. See Figure 2-8.

  The red arrow, which represents the generator frequency, must align with the green section, which represents the window of acceptable phase difference. If the red arrow is rotating clockwise, then the generator frequency is faster than the bus frequency. If the red arrow is rotating counterclockwise, then the generator frequency is slower than the bus frequency.

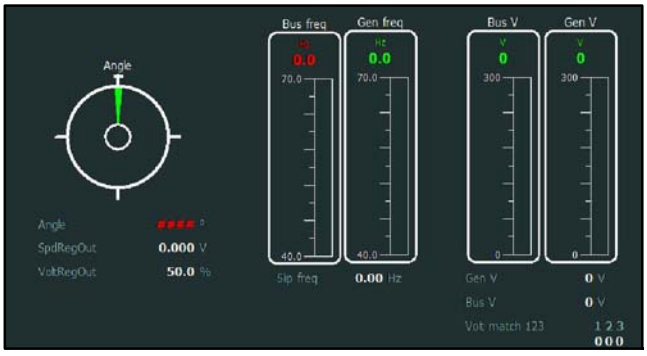


Figure 2-8 Parallel Screen

- **Engine Metering 1:** Displays the main engine temperature and pressure readouts such as oil temperature and pressure and water, exhaust, and air temperatures. Bar graphs visualize the warning and shutdown setpoints in yellow and red markers. See Figure 2-9.

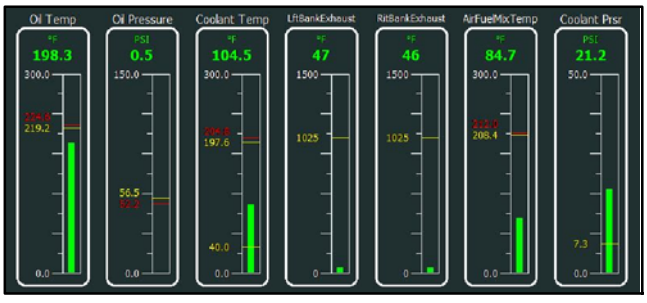


Figure 2-9 Engine Metering 1 Screen

- **Engine Metering 2:** Provides essential readouts from various engine sensors. See Figure 2-10.

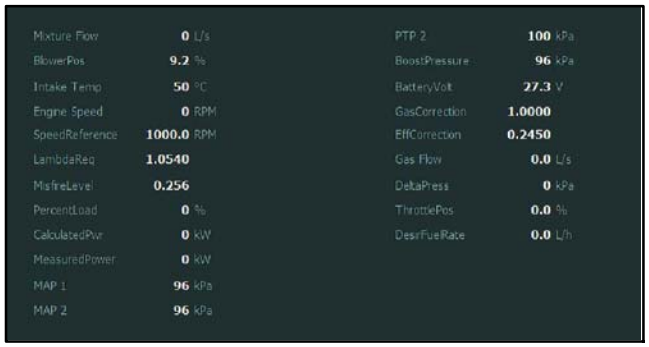


Figure 2-10 Engine Metering 2 Screen

- **Power Management:** The power management screen displays the criteria used to add or remove the generator set to the load. Power management is typically used in paralleling applications. See Figure 2-11.

  Note: For *Gens On 0-15*, generators are represented by 1s and 0s. 1 represents generator sets which are connected to the bus and sharing the load.

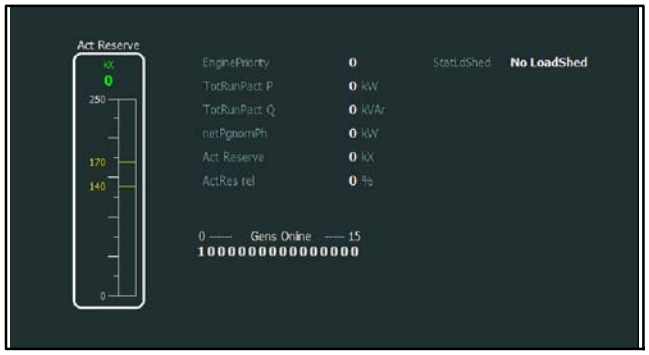


Figure 2-11 Power Management Screen

- **Statistic:** Displays the operation data such as run hours, number of starts, kW hours, and service time (the hours until next scheduled service alarm). See Figure 2-12. See Appendix E for engine metering definitions.

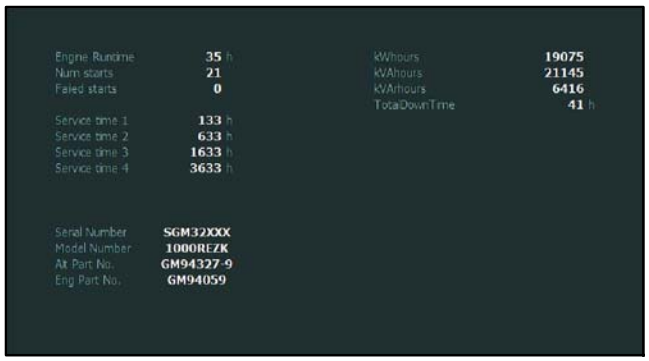


Figure 2-12 Statistic Screen

- **Primary I/O:** Displays a comprehensive view of the status for the primary inputs and outputs. See Figure 2-13.

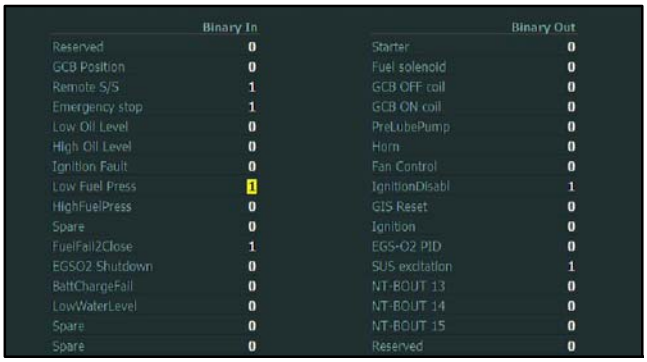


Figure 2-13 Primary I/O Screen

- **Virtual I/O:** Provides a list of virtual or internal binary parameters (inputs and outputs) such as prelube low pressure, high exhaust temperature 1, prelube active, prelube start block, start failure, and underspeed. See Figure 2-14.

Figure 2-14 Virtual I/O Screen

- **Custom I/O:** Displays binary input and output readings from customer connections. See Figure 2-15.

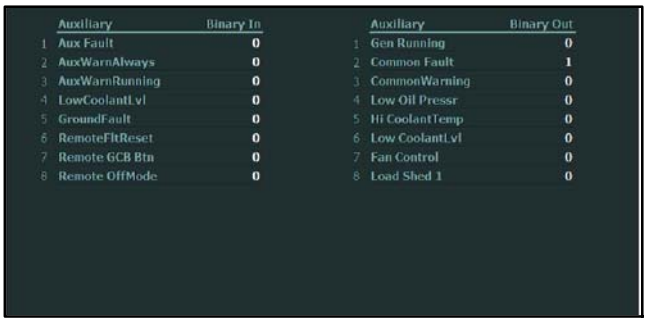


Figure 2-15 Custom I/O Screen

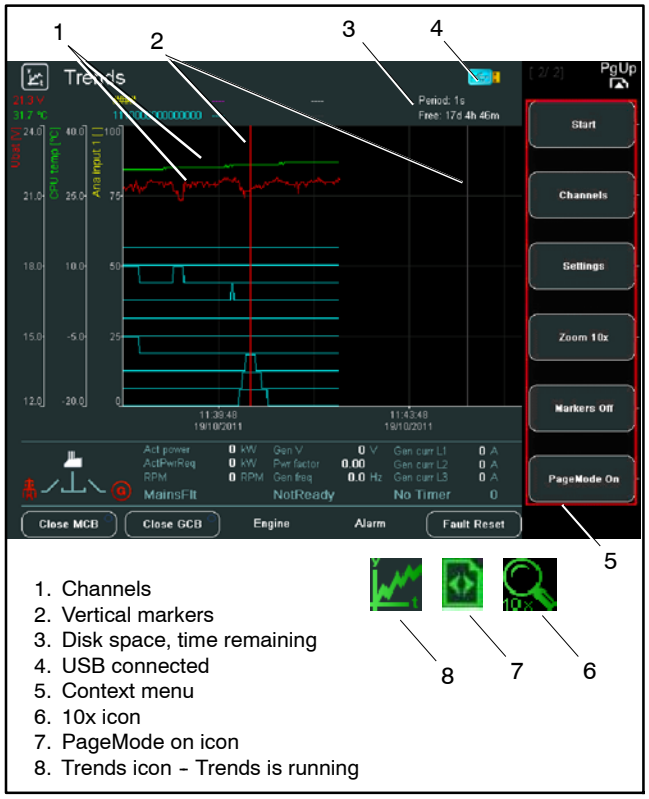
2.6 Trends Monitoring

The Trends screen displays up to eight different values in real-time monitoring. These value selections are displayed in customizable channels to meet various troubleshooting and monitoring situations. The Trends screen displays both binary and analog values. See Figure 2-16.

Data is stored in internal controller memory or internal controller memory and a USB drive and can be easily exported and imported.

Note: All logged data in Trends will be lost if the controller configuration is changed, the Trends settings are changed, or the display is switched off when logged data is only stored in controller memory.

Note: For data storage and exporting data, use the USB-A port.



1. Channels
2. Vertical markers
3. Disk space, time remaining
4. USB connected
5. Context menu
6. 10x icon
7. PageMode on icon
8. Trends icon – Trends is running

Figure 2-16 Trends Screen

2.6.1 Navigation - Trends

- Use the **Trends** button to navigate to the Trends screen.
- Use the **Trends** button to activate and deactivate the context menu.
- Use the **Left** and **Right** buttons to scroll through the Trends data.
- Use the **Page Up** and **Page Down** buttons to quickly scroll through the Trends data.

Note: Scrolling in Trends is cyclic, meaning that the user can scroll from the end of the Trends data to the beginning or from the beginning to the end.

2.6.2 Disk Space Availability - Trends

In Trends monitoring, time remaining corresponds to the amount of free space available for data storage. Important information such as sample period units and remaining time are displayed in the upper right corner of the screen.

Smaller sample periods create more Trends data and use more disk space than larger sample periods. Therefore, smaller sample periods result in less time remaining for Trends logging. See Figure 2-17.

Sample Period	Time of Saturation
1s	12 hours and 15 minutes
1min	30 days and 12 hours

Figure 2-17 Sample Period – Available Time

99 years is the maximum amount of time that can be shown. Any amount of time larger that 99 years is shown as ***>99 years***. See Figure 2-18.

Day:Hour:Minute	dd:hh:mm
Year:Day:Hour	yy:dd:hh
Greater than 99 years	>99 years

Figure 2-18 Time Format of Available Space

Note: When a USB stick is connected, the available time remaining refers to the USB stick free space.

2.6.3 Context Sensitive Buttons – Trends

Use the **Context Sensitive** buttons to operate Trends, change Trends settings, and to export data to a USB stick. See Figure 2-19.

Start/Stop	Starts and stops Trends logging.
Channels	Selects the values for monitoring, determines the display settings for the values, and assigns a color to the value.
Settings	Sets Trends parameters such as grid density, sample period, manual or automatic start, logging mode, and logging storage parameters.
Zoom 1x/10x	Switches zoom curves between 1x and 10x.
Marker On/Off	Switches on/off vertical marker.
PageMode On/Off	Switches on/off PageMode. PageMode allows the viewer to scroll through the Trends log ten time faster than normal.
Export to USB	Single export of Trends log to USB.
Import from USB	Import of stored Trends log from USB.

Figure 2-19 Context Sensitive Buttons

2.6.4 Start and Stop – Trends

Trends operation consists of the Start and Stop buttons. Use these buttons to start and stop trends logging. Start and Stop buttons alternate position in the context menu. When one button is displayed, the other button is hidden depending on the Trends logging status.

When Trends is running or logging data, the Trends icon is visible on the status bar in the lower right corner of the display screen.

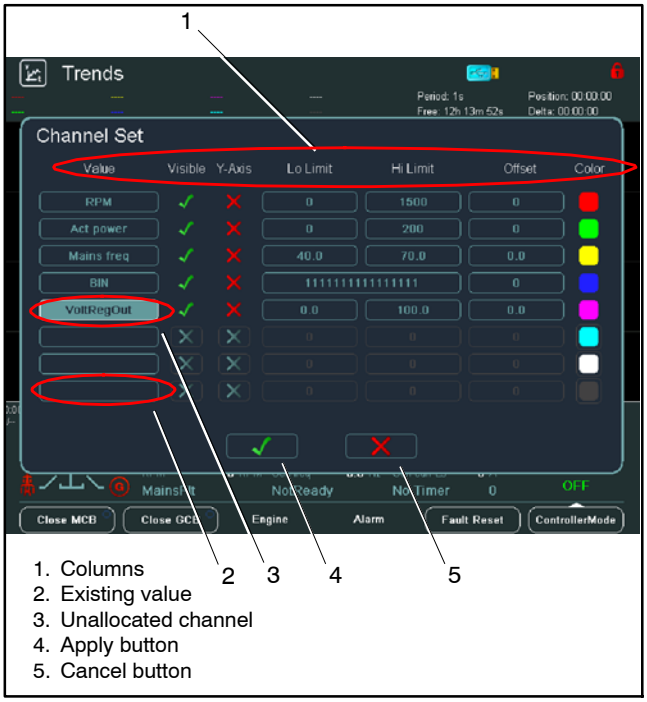
Note: Trends can also be set to start when the Home button is pressed. See Figure 2-25.

Note: When Trends is running or actively monitoring the generator set, only the stop button is accessible. All other buttons are gray and inactive.

2.6.5 Channels – Trends

The channel screen allows the user to select and display values for each channel. The user can select binary and analog values for up to eight channels. To change the channel settings, use the following steps.

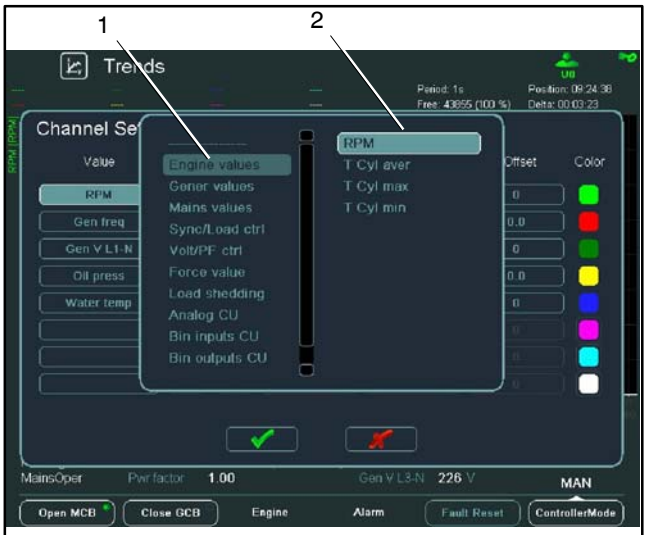
1. Press the **Channel** button from the context menu. The Channel Set window opens. See Figure 2-20.



1. Columns
2. Existing value
3. Unallocated channel
4. Apply button
5. Cancel button

Figure 2-20 Channel Window

2. Use the **Up** and **Down** navigation buttons to select an existing value or an unallocated channel. Press **Enter** to open the list of available values. See Figure 2-21.



1. Value groups – left column
2. Selectable values – right column

Figure 2-21 Values List

3. Use the **Up**, **Down**, **Page Up**, and **Page Down** buttons to scroll through the values. Use the **Left** and **Right** navigation buttons to switch columns.

Note: The left column on the screen displays value groups and the right column displays selectable values.

4. Highlight a value and press **Enter** to select that value.

5. After a value has been selected, use the **Left** and **Right** navigation buttons to select settings in another column.

6. In the Visible column, press **Enter** to switch on/off the channel visibility.

7. In the Y-Axis column, press **Enter** to switch on/off Y-Axis visibility.

8. In the Lo Limit column, press **Enter** to open the Lo Limit window. To set the low limit, use the **Left** and **Right** buttons to change cursor position and the **Up** and **Down** buttons to change the numerical value. Press Enter to close the window.

9. Use same process shown in step 8 to set the Hi Limit and Offset values.

Note: High and low value ranges are only available for analog signals. A binary signal will span the Lo Limit and Hi Limit columns. See Figure 2-23.

10. In the Color column, press **Enter** to open the Color window. Highlight the desired color and press **Enter** to set the color for the channel. See Figure 2-22.

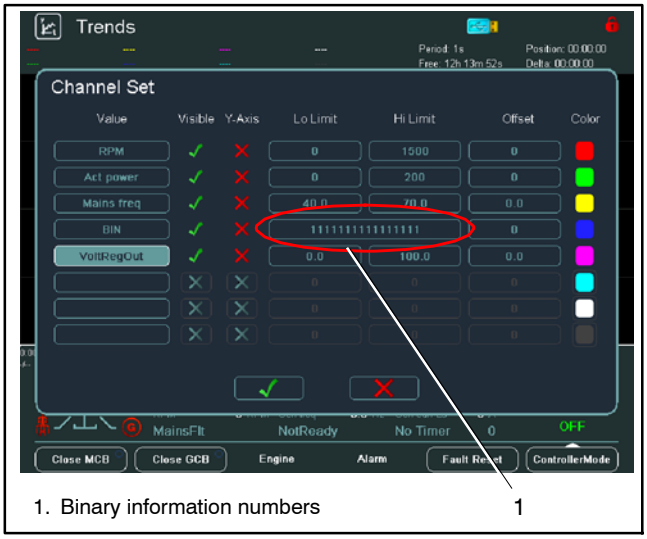
Figure 2-22 Color Window

11. To confirm and set the channel values, highlight the checkmark at the bottom of the Channel Set window and press **Enter**. The Channel Set window closes.

For a binary value, the user can select specific bits of the binary signal to be visible in the Trends screen. The binary information number displays a ***1*** for a visible bit value and a ***0*** for an invisible bit value. By default, all bits are set as 1 or visible.

To change binary information visibility:

12. Highlight the binary information numbers (ones and zeros) and press **Enter**. See Figure 2-23. The Binary Set window opens.



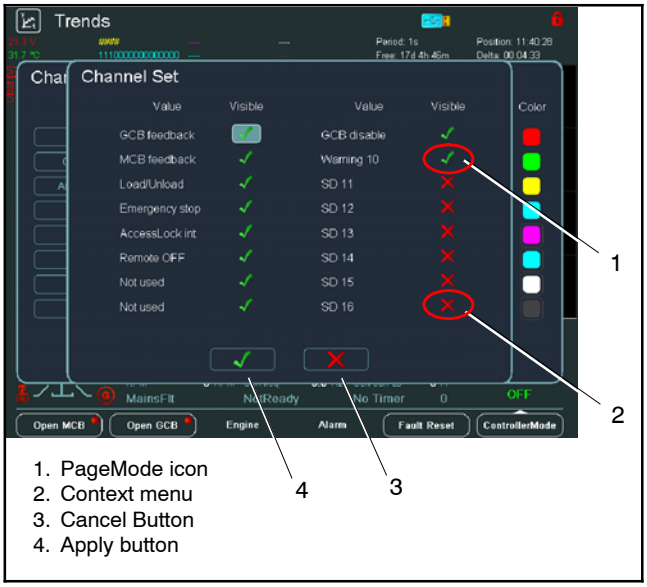
1. Binary information numbers

Figure 2-23 Binary Information Number

13. Scroll through the Binary information bits and set a checkmark to make the bit visible or an X for invisible. See Figure 2-24.

14. Highlight the large checkmark at the bottom of the Binary Set window and press **Enter** to set the visibility values.

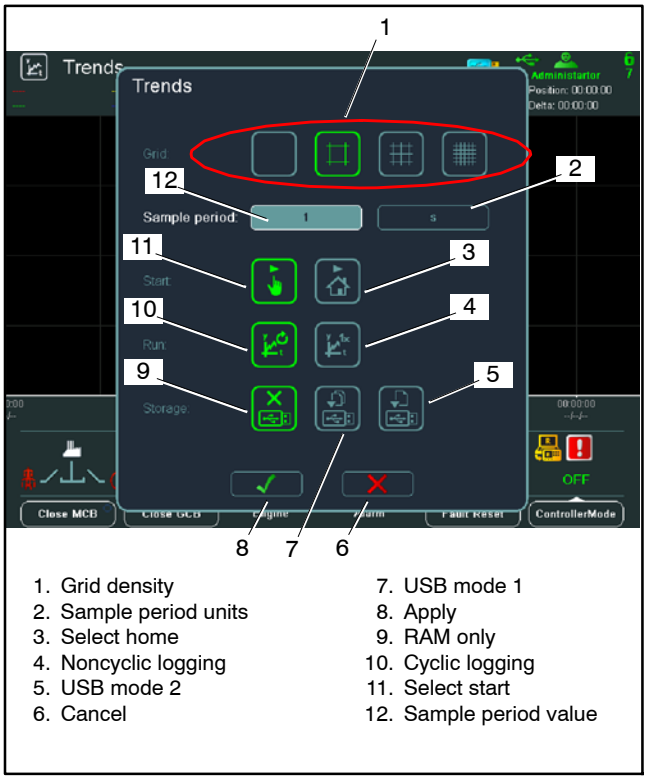
15. To confirm and set the binary values, highlight the checkmark at the bottom of the Binary Set window and press **Enter**. The Binary Set window closes.



1. PageMode icon
2. Context menu
3. Cancel Button
4. Apply button

Figure 2-24 Binary Set Window

2.6.6 Settings - Trends



1. Grid density
2. Sample period units
3. Select home
4. Noncyclic logging
5. USB mode 2
6. Cancel
7. USB mode 1
8. Apply
9. RAM only
10. Cyclic logging
11. Select start
12. Sample period value

Figure 2-25 Trends Settings Window

In the Settings window, the user can change the Trend parameters such as grid, sample period, start, run modes, and types of storage. See Figure 2-25. Use the following instructions to adjust Trend parameters.

1. Press the Settings button in the context menu to open the Settings window.
2. Use the navigation buttons to select the desired grid density setting.
   - **Grid Density:** The grid icons depicts the level of grid density progressing in density level from left to right.
3. Move the cursor to the sample periods and press **Enter** to open the Sample Period window. Use the **Left** and **Right** buttons to move the cursor and the **Up** and **Down** buttons to increase and decrease the numerical value. Press **Enter** to set the value and close the window.
   - **Sample Period:** Sets the numerical value for the sample period.
4. In the Units window, use the navigation buttons to select either seconds or minutes for the sample period.
   - **Units:** Sets either seconds or minutes as the unit of measurement for the sample period.
5. Move the cursor to the Start row and highlight the icon for the start signal.
   - **Select Start:** Set the Start button in the context menu as the start signal for Trends (first icon in the row).
   - **Select Home:** Sets the Home button as the start signal for Trends (second icon in the row).
6. Move the cursor to the Run row and select either the Cyclic or Noncyclic Logging modes.
   - **Cyclic Logging:** Overwrites the oldest data when memory is full.
   - **Noncyclic Logging:** Sets Trends to continue logging values unless RAM memory is no longer available.
7. Move the cursor to the Storage row and select the storage method.
   - **RAM Only:** Sets storage to log data to RAM memory only.
   - **USB Mode 1:** Sets storage to be progressively saved in multiple files. The files size is set to be the size of RAM memory reserved for Trends. When RAM memory is full, a new file is created. When USB memory is full, the oldest file is deleted to create space for new files.
   - **USB Mode 2:** Sets storage to be saved to USB and RAM in a single file. When RAM memory is full, the oldest data in the file is overwritten by new data creating a circular buffer.
8. To confirm the Trends settings, highlight the checkmark at the bottom of the window and press **Enter**. The Settings window closes.
   - **Apply Button:** Applies the new settings.
   - **Cancel:** Closes the window without saving the settings.

2.6.7 Zoom 1x/10x - Trends

These buttons change the amount that the Trends monitoring curves are magnified allowing the user to zoom in and out.

The Zoom 1x and Zoom 10x buttons alternate position in the context menu. When one button is displayed, the other button is hidden depending on the Trends logging status.

2.6.8 Marker On/Off - Trends

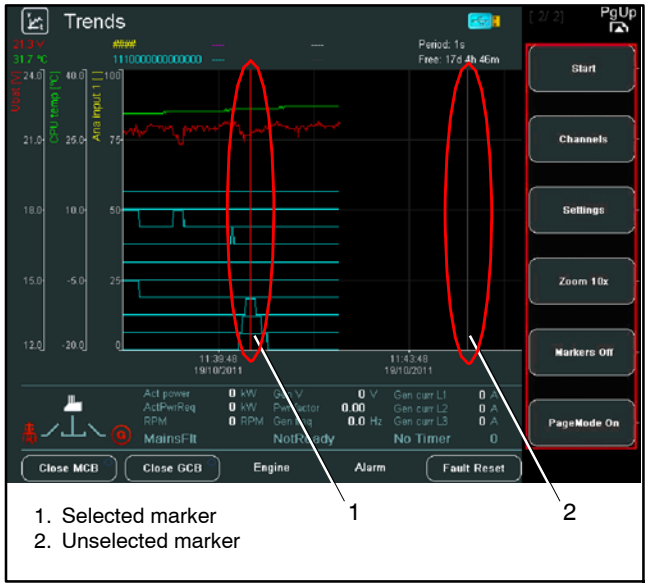
The Markers On/Off button activates and deactivates two vertical markers. See Figure 2-26. Use these markers to mark and measure the time between two logged trends (delta time). The delta time is displayed in the upper right corner of the screen.

1. To move the markers, press the **Marker On** button in the context menu. Two markers will appear on the screen. The selected marker is highlighted in red and the unselected marker is gray. See Figure 2-26.

2. To toggle the marker selection, press **Enter**. Use the **Left** and **Right** navigation buttons to move the marker.

   Note: Markers can be moved as far apart as needed and do not need to remain on the same screen.

3. To reset the marker positions, deactivate and then activate the markers by pressing the **Marker On/Off** button.



1. Selected marker
2. Unselected marker

Figure 2-26 Vertical Markers

2.6.9 PageMode - Trends

PageMode changes the rate that the Left and Right navigation buttons scroll or move the selected marker through the logged data. When Page Mode is ON, the marker scrolls ten times faster.

2.6.10 Export to USB - Trends

Exporting allows Trends data to be opened and analyzed in Access®, Excel®, or other third party database software. Trends data can be exported to USB storage in two ways:

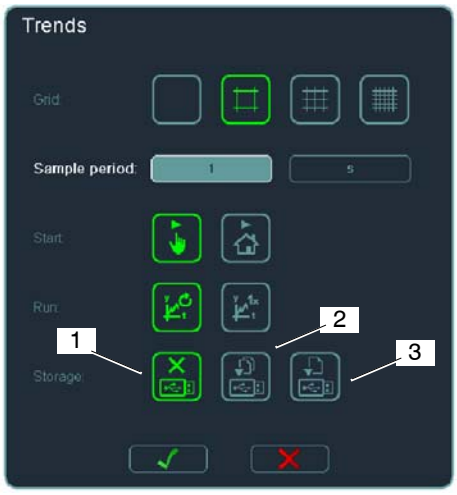
- Continuous saving of Trends data
- Single export of Trends data

Continuous savings of trends data

Continuous savings protects against loss of data in RAM memory due to a power outage. Data is saved in RAM memory using a 4 kB buffer. When the buffer is full, the memory is saved to the USB stick. See Figure 2-27. Continuous savings has two mode settings:

- **USB Mode 1:** Sets storage to be progressively saved in multiple files.
- **USB Mode 2:** Sets storage to be saved to USB and RAM in a single file, ***trends-circular.TRD***.

Note: On the USB stick, Trends data saves to a dedicated Trends directory. The file extension for the data file is *.TRD*.



1. RAM only
2. USB mode 1
3. USB mode 2

Figure 2-27 USB Modes Settings

Access® and Excel® are a registered trademarks of Microsoft Corporation.

Single export of trends data

Single export allows user to manually export Trends data. Single export has three requirements:

- Trend savings is stopped
- USB stick is connected
- At least one channel is defined and saved in RAM memory.

The Export-to-USB button in the context menu exports Trends data to either a Winscope (SDT) or a Microsoft Excel (CSV) file format. Figure 2-28 displays the different content available for the two file formats.

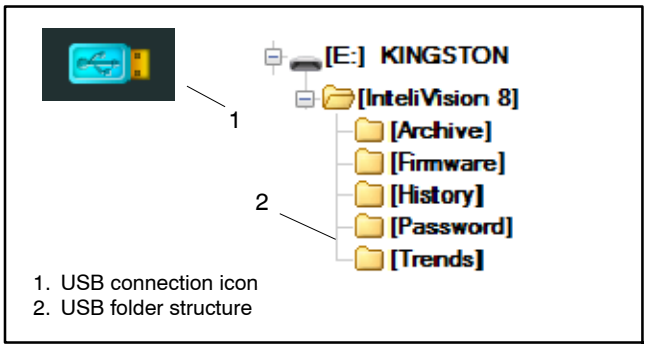
	STD	CSV
Channel definition	Yes	No
Channel data	Yes	Yes
Binary bits	Yes	Yes
Start/Stop marker	Yes	No

Figure 2-28 File Format Features

The Trends file is exported to a dedicated Trends folder structure. See Figure 2-29. The Trends file is saved in the following format:

trends-[genset name]-[date--time].STD
trends-[genset name]-[date--time].CSV
(example: trends-GenSet1-07-11-15--14-00-22.csv).

Note: The export progress bar displays the export file name and USB folder directory. See Figure 2-29.



1. USB connection icon
2. USB folder structure

Figure 2-29 USB Features

To export a Trends data file, use the following steps:

1. Insert a USB stick into the USB-A port. A blue USB icon will appear at the top of the screen.
2. In the context menu, press the **Export-to-USB** button. The Select Exported Data Format window opens. See Figure 2-30.

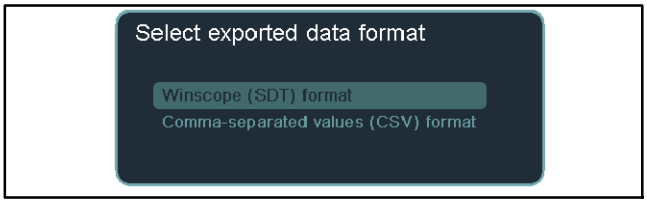
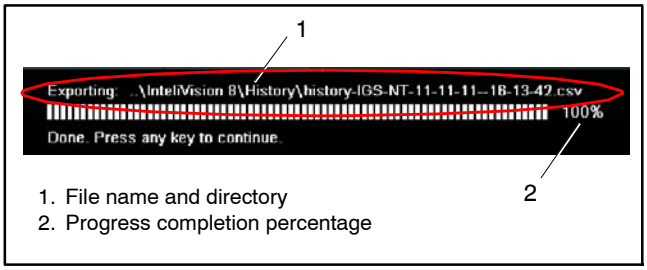


Figure 2-30 File Format Selection

3. Use the **Up** and **Down** navigation buttons to select the desired file format and press the **Enter** button to export the Trends data. The USB icon turns red and an export progress bar opens. See Figure 2-31.

Note: When the export is finished the progress bar indicates 100% complete and the USB icon returns to blue.

4. Press any key to close the progress bar.



1. File name and directory
2. Progress completion percentage

Figure 2-31 Export Progress Bar

2.6.11 Import from USB – Trends

Only continuously saved files (TRD) can be imported. To import a Trends data file, use the following steps:

1. Insert a USB stick that contains continuously saved Trends data into the USB-A port. A blue USB icon will appear at the top of the screen.

2. In the context menu, press the **Import-from-USB** button. The Select File window opens and previously saved .TRD files are displayed in the window. See Figure 2-32.

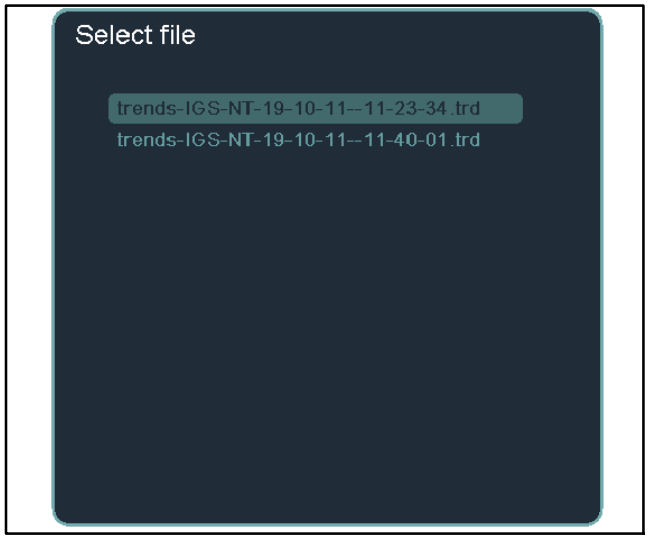


Figure 2-32 Trends Import Window

3. Use the **Up** and **Down** navigation buttons to select the desired file and press the **Enter** button to import the Trends data. The USB icon turns green and progress bar opens.

Note: When the import is finished the progress bar indicates 100% complete and the USB icon returns to blue.

4. Press any key to close the progress bar.

2.7 Setpoints

Setpoint screens enable users to access and change various analog, binary, or special data object controller settings.

Most generator set and controller settings are located under a setpoint screen. These settings range from generator set and engine parameters to alarms, protection, timers, controller settings, load shedding, and paralleling parameters.

Setpoints are collected to groups according to their meaning. Setpoints can be adjusted from the controller front panel, PC with InteliMonitor or WebSupervisor, or MODBUS®.

All setpoint screens are similar in appearance with a list of setpoints on the left side of the screen and specific setpoint data on the right side of the screen.

Note: Saving a backup copy of setpoints will allow prior settings to be reloaded when needed.

Password protection

Any setpoint can be password protected – 7 levels of protection are available. There can be up to 8 users defined, each one with different access rights (levels of protection). Every user has a five-digit numerical password. Users can only adjust the setpoints that are accessible to their security level or lower. See Figure 2-50.

If a user logs in from a particular terminal (for example the controller front panel), this does not unlock the other terminals for him.

When accessed from the controller display, setpoints are automatically closed (return to measurement screens) 15 minutes after the last setpoint change or when wrong value of the password is set.

Note: When attempting to edit a locked setpoint, the Login window opens so the user can log in and access the locked setpoint.

Continuous internal evaluation of setpoints validity

In case of detection of Setpoints checksum (validity) evaluation error, the Shutdown alarm *Setpoint CS error* is issued to prevent the controller from running the engine with incorrect setting. The evaluation is provided at controller startup and continuously during the standard operation. For example, in case of detection of such error, the engine is shut down immediately.

Setpoint synchronization

Setpoints that are marked with # sign at the begin of their names are synchronized with other controllers present on the CAN bus line (for example. the system will ensure that the respective setpoint will have identical value in each connected controller). If the setpoint is changed in one controller, the same change will occur in all other controllers. This function is necessary especially where the system of Power management is based on the respective setpoints being identical in all controllers.

2.7.1 Navigation - Setpoints

- Use the **Settings** button to navigate back to the last setpoint screen that was accessed.
- Use the **Settings** button to activate and deactivate the context menu.
- Use the **Context Sensitive** buttons to jump to a specific Setpoint screen.
- Use the **navigation arrow** buttons to scroll through the context menu.
- Use **Page Up** and **Page Down** buttons to quickly scroll through the context menu.
- Use **Page Up** and **Page Down** buttons to quickly scroll through a list.

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2.7.2 Context Sensitive Buttons - Setpoints

The Setpoint context menu displays a list of setpoints which categorizes setpoints and makes setpoints easily accessible. Figure 2-33 displays a list of all Setpoint categories in the context menu.

Context Menu	Definition
ProcessControl	Parameters for controlling active and reactive power control modes such as system base load, local base load, and system base power factor
SUS control	Start-up synchronization sequence — not applicable
Basic settings	Basic generator set parameters such as voltage, power, current, frequency, RPM, and controller settings.
Comms settings	Communication settings for Ethernet, Modbus RS-232 and RS-485, and SMTP
Engine params	Basic parameters for starting and stopping the engine such as prelube time, maximum crank time, after cool time, and stop time
Engine protect	Engine protections parameters such as overspeed and service time
Gener protect	Generator set protection parameters typically regarding electrical output
Pwr management	Power management, running hour equalization, and load demand swap parameters
Sync/Load ctrl	Load synchronizing parameters such as frequency gain, angle gain, load ramp, speed governor high and low limits, and generator circuit breaker open level
Volt/PF ctrl	Voltage/power factor control parameters
Force value	Force value parameters
Load shedding	Load shed parameters
Timer settings	Timer setting parameters
Act. calls/SMS	E-mail and SMS messaging parameters
Date/Time	Date, time, summer mode, time stamping, and pre-shutdown history parameters.
Analog protect	Analog protection parameters such as battery voltage, oil temperature, oil pressure, and coolant temperature.
Programmable Logic Control (PLC)	Logic for prelube delay, high exhaust warning delay, cooling fan on and off settings

Figure 2-33 Setpoint Context Menus

2.7.3 Editing - Setpoints

Editing setpoints can significantly change the performance of the generator set. Setpoints can be locked and only accessible with administrative permissions. A locked Setpoint will exhibit a red locked or Access Level icon.

Note: Changing setpoints can significantly affect the operation of the generator set. Some settings are locked and adjustment should only be performed by a certified Kohler technician.

IMPORTANT! Do not perform repeated writing of setpoints (for example, power control from a PLC by repeated writing of baseload setpoint via Modbus) The setpoints are stored in EEPROM memory, which can be overwritten up to 10^5 times without risk of damage or data loss, however it may become damaged, when the allowed number of writing cycles is exceeded!

Setpoint values fall into four types of editable categories.

- Numerical value
- Text list selection
- Editable text value
- Combination of numerical and text value

Note: Before editing setpoints, save an archive file to a USB stick to backup the setpoints. This backup file will allow settings to be retrieved and reset if necessary. Use the USB-A port.

Note: If a value is out-of-range, the field turns red and the value cannot be applied.

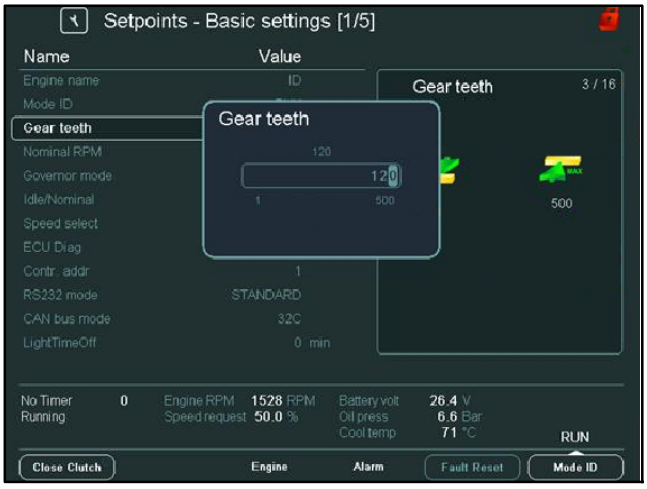


Figure 2-34 Numerical Setpoints

To change value in a **text list**, use the following steps.

1. Select the desired setpoint from a setpoint list and press **Enter**. The setpoint value window opens. See Figure 2-35.

2. To select the text value, use the **Up** and **Down** buttons to highlight the value.

3. Press **Enter** to apply the value and close the window.

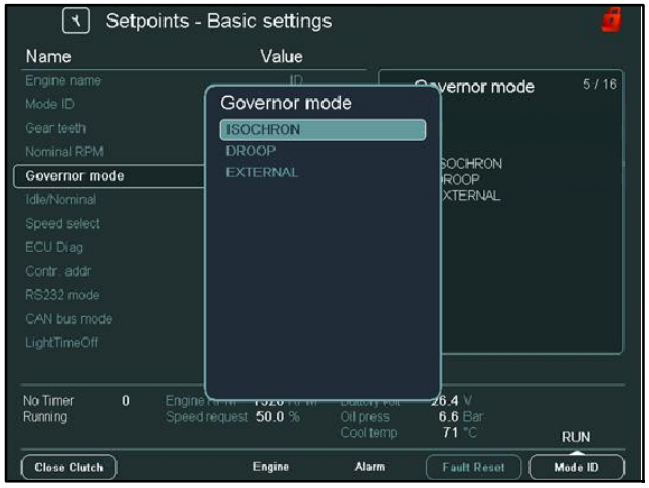


Figure 2-35 Text List Setpoints

To change an **editable text** value such as the engine name, use the following steps.

1. Select the desired setpoint from a setpoint list and press **Enter**. The setpoint value window opens. See Figure 2-36.

2. To edit the text value, use the navigation buttons to highlight a letter and press **Enter** to add the letter to the value.

3. When finished, highlight the checkmark and press **Enter** to apply the value and close the window.

Figure 2-36 Editable Text Setpoints

2.7.4 Forced Values

Force values are used to temporarily change setpoint values under given conditions. For example, the MaxCrank time setpoint sets the crank time to 15 seconds. However, after the third failed crank attempt, the program logic uses Force Value 5 to change the time to 20 seconds.

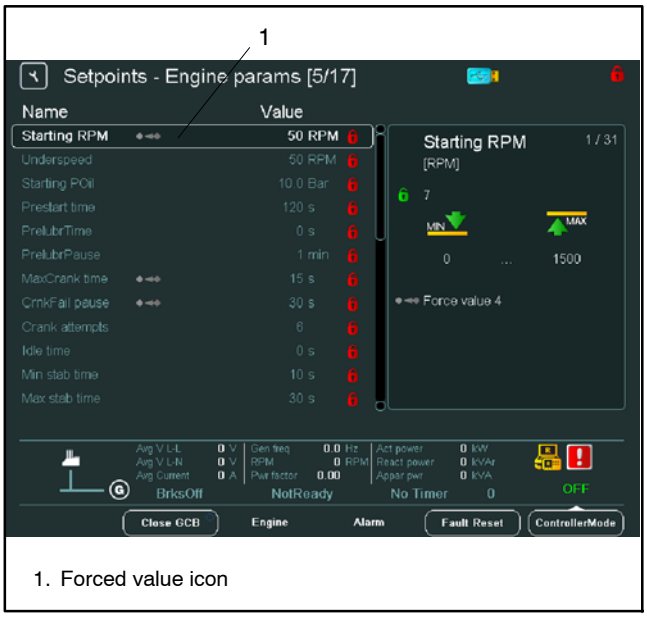
Force Values are indicated on the setpoint screens by an arrow next to the setpoint. See Figure 2-37. For definitions of specific forced values, see Appendix C.

To change a **numerical value**, use the following steps.

1. Select the desired setpoint from a setpoint list and press **Enter**. The setpoint value window opens. See Figure 2-34.

2. To set the numerical value, use the **Left** and **Right** buttons to change cursor position and the **Up** and **Down** buttons to change the numerical value.

3. Press **Enter** to close the window.



1. Forced value icon

Figure 2-37 Forced Value

2.8 Alarms

The AlarmList screen displays level 1 alarms (yellow), level 2 alarms (red), and engine messages (blue) in a color coded list. The AlarmList screen displays up to sixteen alarms at a time. When displaying four alarms or fewer, the AlarmList uses a larger font size for better visibility. Features for the AlarmList screen include an alarm summary at the bottom of the screen and an alarm alert icon that appears at the status bar. See Figure 2-38.

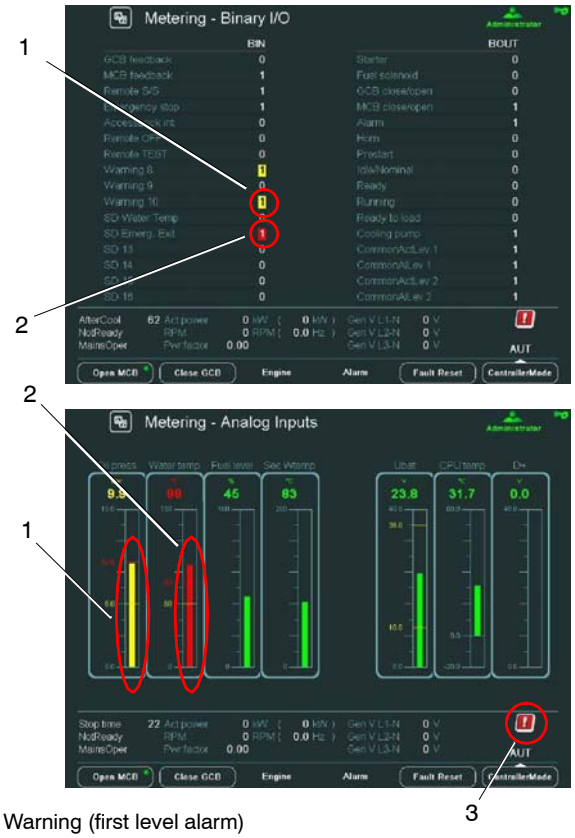
There are several types of alarms which perform specific functions. Some alarms activate a horn and LED indication lights, some initiate shutdowns, some only appear in the alarm list, and other types are only recorded as a history event and do not display in the alarm list. See Section 4.4.14, Section 4.4.15, and Appendix D for details.

1. Active unacknowledged shutdown alarm
2. Active unacknowledged engine alarm
3. Active acknowledged warning alarm
4. Alarm summary bar.
5. Inactive acknowledged shutdown alarm
6. Alarm indication icon
7. Sum of all alarms
8. Number of active alarms
9. Number of unacknowledged alarms

Figure 2-38 AlarmList Screen Features

When viewing a metering screen and a new alarm is detected, the AlarmList screen will display automatically. However, when viewing another screen such as History or Setpoints, an alarm indication icon will appear on the status bar at the bottom of the screen. The user must go to the AlarmList screen to view the alarm.

Alarms are also visible in several metering screens such as the Binary I/O screen and the Analog Inputs screen. Alarms are displayed in yellow or red to indicate the alarm level. See Figure 2-39.



1. Warning (first level alarm)
2. Shutdown (second level alarm)
3. Alarm indication icon

Figure 2-39 Alarm Indications

Alarms and engine messages are color coded and marked to indicate the type of alarm and whether the alarm has been acknowledge.

- Yellow indicates a level 1 alarm.
- Red indicates a level 2 alarm.
- Blue indicates an engine message.
- Gray indicates lost communication with a sensor and is indicated by *FLS* preceding the alarm text.
- A star indicates that the alarm is unacknowledged.

See Figure 2-40 for alarm types. See Appendix C for a list of alarms. For blue engine messages, refer to the CAN communication list in the engine installation manual.

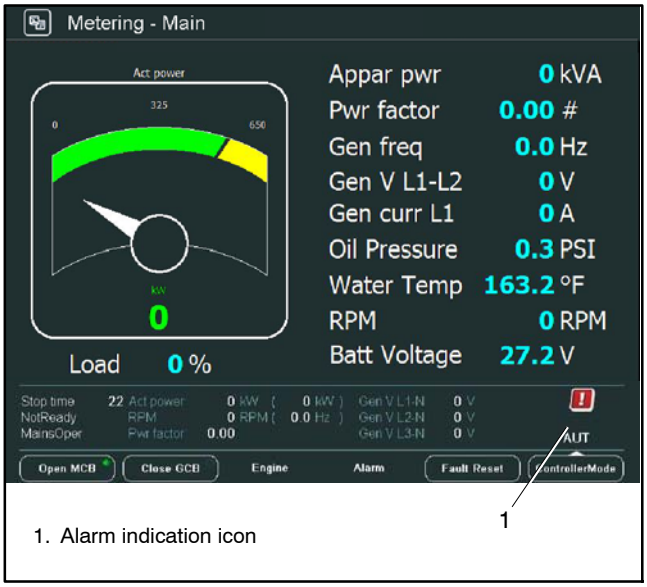
Active and unacknowledged	
Warning	* Yellow background + gray star
Shutdown	* Red background + gray star
Engine Message	* Blue background + gray star
Lost Sensor Communication (FLS)	*Gray background + gray star
Active and acknowledged	
Warning	Yellow background
Shutdown	Red background
Engine Message	Blue background
Lost Sensor Communication (FLS)	Gray background
Inactive and unacknowledged	
Warning	* Yellow text + black star
Shutdown	* Red text + black star
Engine Message	* Blue text + black star
Lost Sensor Communication (FLS)	*Gray text + black star

Figure 2-40 Alarm Types and Color Schemes

To clear an alarm, follow these steps:

1. To navigate to the AlarmList screen, press the **Alarms** button. Use the navigation arrow buttons to scroll through the alarms.
2. To acknowledge an alarm(s), press the **Fault Reset** button. Fault Reset will acknowledge all of current faults on the screen. Once the alarm is acknowledged, the alarm indication LED light stops flashing.

   Note: Use the Fault Reset button to acknowledge a fault from any screen.
3. To clear the alarm, resolve the fault. The alarm will disappear from the AlarmList. When all faults are resolved, the alarm indication LED light will turn off and the alarm indication icon will disappear.



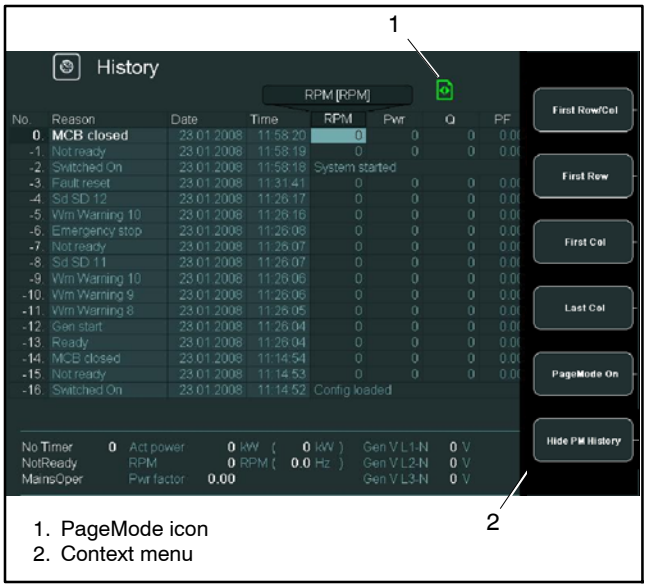
1. Alarm indication icon

Figure 2-41 Alarm Indication on Status Bar

2.9 History

The History screen displays up to 4000 events, warnings, and shutdowns with the reason, date, time, and critical system parameters. This extensive event history enables detailed analysis of reoccurring faults. See Figure 2-42.

The History screen displays each event as a row and lists the events according to date. Each event logs numerous system parameters at the time of the event and displays these parameters in columns. To enhance accessibility of data, the user can rearrange the parameter columns.



1. PageMode icon
2. Context menu

Figure 2-42 History Screen

2.9.1 Navigation - History

- Use the **History** button to return to the History screen. The last row and column that was accessed will be visible.
- Use the **History** button to activate and deactivate the context menu.
- Use the **Context Sensitive** buttons to scroll quickly through event parameters. See Figure 2-43.
- Use the navigation arrow buttons to move the cursor one row or parameter column at a time.

2.9.2 Context Sensitive Buttons

First Row/Col	Jump to the first moveable column and first row (the first column is RPM by default – it is not possible to move columns Reason, Date and Time).
First Row	Jump to the first row.
First Col	Jump to the first column.
Last Col	Jump to the last column.
PageMode On	When PageMode is ON, use the left and right navigation buttons to jump to the next page of columns. This mode enables quicker navigation through columns. PageMode Icon appears at the top of the screen when PageMode is ON.
Hide PM History	Hides the pre-mortem history from the list of events.
Export-to-USB	Exports a csv file to a connected USB stick. A USB stick must be connected to the controller for this option to be enabled.

Figure 2-43 Context Sensitive Buttons

2.9.3 Changing the Order of Columns

The user can arrange the event parameter columns to best suite their application. However, the first four parameter columns (No., Reason, Date, and Time) cannot change position and will always be shown as the first four columns on the History screen. To rearrange the other parameter columns, use the following steps:

1. Use the **Left** and **Right** navigation buttons to move the cursor to the desired parameter column.
2. Press the **Enter** button to select the parameter column. The column highlights yellow when selected. See Figure 2-44.
3. Once the column is selected, use the **Left** and **Right** navigation buttons to move the column.
4. Press the **Enter** button to confirm the new column position or the **Escape** button to cancel the action.

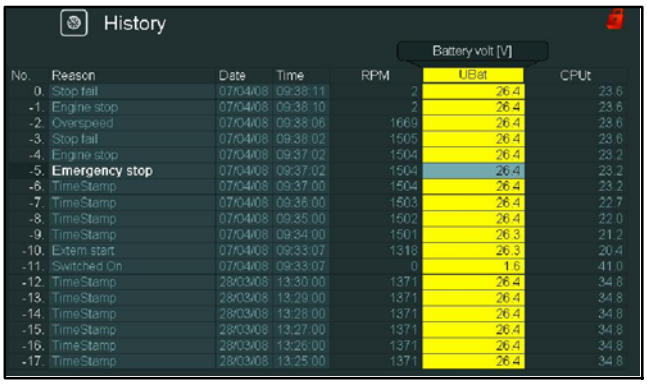


Figure 2-44 Column Selection

2.9.4 Hide PM History

This button hides the pre-mortem history from the list of events. Pre-mortem history is the fast history running in background. Pre-mortem history is mirrored into the controller history records to become post-mortem records when a second level alarm occurs. Alarms that initialized flipping of the post-mortem history are: Shut down (SD), Slow stop (STP), Overspeed, Short Current, Breaker open & cool-down (BOC), Low power (LOP), Off load (OFL). Post-mortem history records are defined with the name PreAlarm stamp.

Note: See Appendix D for alarm types.

Figure 2-45 Hide PM History

2.9.5 Exporting to a USB Stick

The **Export-to-History** button in the context menu exports history event data to a csv file. The history data file is exported to a dedicated folder structure created automatically after plugging in USB storage. See Figure 2-46. The history file is saved in the following format:

history-[genset name]-[date--time].csv
(example: history-GenSet1-07-11-15--14-00-22.csv).

Note: Use the Page Down button to locate the Export-to-USB button on the second screen.

Note: The export progress bar displays the export file name and USB folder directory. See Figure 2-47.

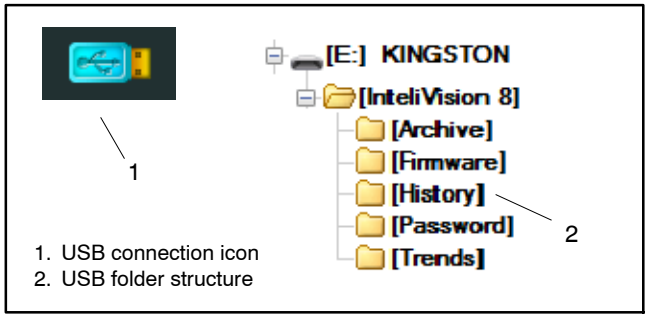


Figure 2-46 USB Features

To export a history file, use the following steps:

1. Insert a USB stick into the USB-A port. A blue USB icon will appear at the top of the screen.

2. In the context menu, press the **Export-to-History** button. The USB icon turns red and an export progress bar opens. See Figure 2-47.

Note: When the export is finished the progress bar indicates 100% complete and the USB icon returns to blue.

3. Press any key to close the progress bar.

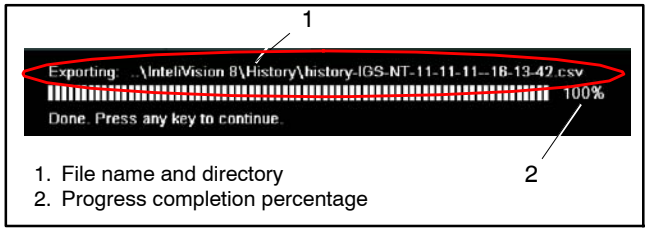


Figure 2-47 Export Progress Bar

4. When opening the exported file (.csv) in Microsoft Excel, use the following procedure to view the text in a legible format.

   a. In Excel, click on the **Data** tab and then use the **Import From Text** option.

   b. Select the exported file (.csv) on the USB stick and then select **Import**.

   c. In the Text Import Wizard, select delimited as the file type.

   d. Select Next and then select Semicolon under Delimiters.

   e. Click Finish to open.

2.10 Help/Others

The Help/Others screens are a compilation of several help lists, controller settings, and information screens. These screens cover topics such as navigation help, controller alarm help, user/passwords settings, communication settings, language selection, and controller information. See Figure 2-48.

1. Context menu
2. Page down icon

Figure 2-48 Help/Others Screen

2.10.1 Navigation - Help/Others

- Use the **Help** button to jump to the main Help/Others screen.
- Use the **Help** button to activate and deactivate the context menu.
- Use the **Context Sensitive** buttons to jump to a specific screen.
- Use the **Page Up** and **Page Down** buttons to scroll through the help lists or the context menu.

2.10.2 Context Sensitive Buttons - Help/Others

Users/Password	Settings for logging in and changing or saving a password.
Communication	Communication settings for connecting to the display
Languages	Language settings
CU Alarm Help	Controller alarm help
IV Info	Information about the display
Controller Info	Information about the controller
IV Settings	Backlight timer settings (time after which the display will dim)
Export to USB	Exports the controller or display firmware to a USB stick.
Setpoints Set	Allows the user to change the default setpoints for the controller or to revert to the default setpoints.
Firmware Update	Imports the Display firmware from a USB stick.

Figure 2-49 Context Sensitive Buttons

2.10.3 Users/Password - Help/Others

The User/Password screen allows a user to sign into the controller and to manage user accounts and passwords. The user's permission settings determines their level of access.

There are three predefined users created in the Decision-Maker® 8000. Each user has a different access level. See Figure 2-50.

Note: To protect the operation of the generator set, some settings are restricted to Kohler certified technicians or to factory use. Refer to Appendix B to view the access levels for each setpoint.

User	Intended Usage	Access Level	Initial Password
User	Basic viewing and operation	0, 1	0
Technician	Onsite configuration settings	2, 3, 4	Protected, Not Disclosed
Factory	Factory use only	5, 6, 7	Protected, Not Disclosed

Figure 2-50 User Access Levels and Passwords

The following instructions show how to log on to the controller, how to change or save a password, and how to logout.

A user can enter a password either manually or by loading the password from a USB stick. Both procedures for logging on are covered in the following steps.

Logging-on to the controller manually:

1. Press the ***Help/Others*** button and then press the ***Users/Password*** button from the context menu.

Figure 2-51 Help/Others Password

2. Select the ***Users*** field and press **Enter**. The Users window opens.

3. Select a user name from the list and press **Enter**. The Users window closes.

4. Select the ***EnterPassword*** field and press **Enter**. The Password window opens. See Figure 2-51.

   Note: Use the password shown in Figure 2-50 to log on to the controller for the first time. Once logged-on, the initial password can then be changed.

5. Use the **Up** and **Down** navigation buttons to enter the five digit password and press **Enter**.

6. Select ***Login*** to confirm the password or ***X*** to cancel and exit. When successfully logged on, a user icon appears in the top right corner of the display.

Changing a password:

Note: Only a user with administration level access (Factory-3) can reset a password to default (0) for other users. However, administration level access does not allow the user to change other users passwords.

1. From the User/Password screen, select the ***Users*** field and press **Enter**. The Users window opens.

2. Select a user name from the list and press **Enter**. The Users window closes.

3. Select the ***NewPassword*** field and press **Enter**. The New Password window opens.

4. Use the **Up** and **Down** navigation buttons to enter the new five digit password and press **Enter**.

5. Select ***ChangePassword*** and press **Enter** to confirm the password.

Note: The user must be logged in to the controller for the ChangePassword option to be available.

Saving a password to a USB stick:

The Decision-Maker® 8000 allows users to load a saved password from a USB stick. To save a password to a USB stick, use the following steps.

6. Insert a USB stick into the USB-A port.

7. From the User/Password screen, select ***SavePassword*** and press **Enter** to save the password to a USB stick. The password file is saved in the following format:

   password–[genset name].txt
   (example: password–Genset1.txt).

Note: The user must be logged in to the controller for the SavePassword option to be available.

Logging on to the controller with a USB stick:

8. Once a password has been exported to a USB stick, simply insert the USB stick into the USB port. The Login window opens automatically.

9. Press ***Enter*** to confirm the password. When successfully logged on, a user icon appears in the top right corner of the display.

Note: If the user removes the USB stick, the user will be logged out automatically.

Logging out of the controller:

10. From the User/Password screen, select ***Logout*** and press **Enter**. See Figure 2-52.

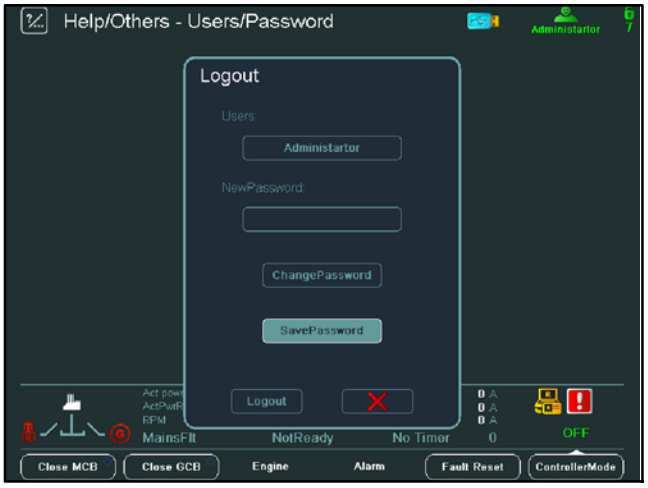


Figure 2-52 Help/Others Password Logout

2.10.4 Communication – Help/Others

The communication screen allows the user to select the communication settings for the controller. See Figure 2-53 to determine the communication settings.

Controller Type	IGS-NT
Connection Type	NT-terminal
Controller Address	Not accessible from this window
Terminal Address	1

Figure 2-53 Communication Settings

Figure 2-54 Communication Screen

Use the following instructions to set the communication settings.

1. Use the **Right** and **Left** navigation buttons to select **IGS-NT** as the controller type. See Figure 2-54.
2. Select the connection type setting and press **Enter** to bring up the Connection Type window.
3. Select **NT-terminal** and press **Enter**. The Connection Type window closes.

Note: The controller address can be selected automatically.

4. Select the Terminal address setting and press **Enter** to bring up the Terminal Address window.
5. Select the terminal address in the window and press **Enter**. The Terminal Address window closes.

Note: The terminal address can be selected automatically.

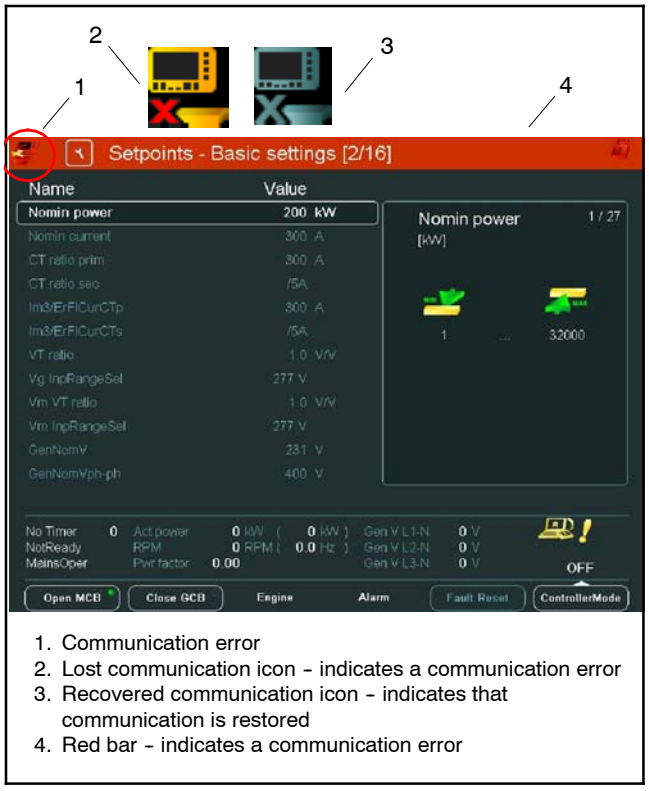
6. Use the **Down** navigation button to select the Checkmark button and press **Enter** to confirm the communication settings.

Communication errors

If communication is lost during configuration, the controller switches to the initialization screen and a red timeout notification appears at the bottom of the screen. See Figure 2-55.

Figure 2-55 Address Detection Timeout

If communication is lost during controller operation, a red bar and the lost communication icon appear at the top of the screen. See Figure 2-56.



1. Communication error
2. Lost communication icon – indicates a communication error
3. Recovered communication icon – indicates that communication is restored
4. Red bar – indicates a communication error

Figure 2-56 Communication Error

When communication is recovered, the red bar disappears and the Lost Communication icon turns gray. Press the **IV Info** button in the History/Others context menu to remove the gray Recovered Communication icon.

If the communication settings are not known, the user can use automatic detection.

1. Select the **Detect** setting under the Terminal Address settings.

2. Select the Checkmark and pressing Enter to run the automatic detection.

In the terminal address window, green means an address is available; red means an address is unavailable.

2.10.5 Languages – Help/Others

This screen allows the user to select a desired language for the controller. See Figure 2-57. To select a language, use the following instructions.

1. Press the **Languages** button on the context menu. The Language screen opens.

2. Use the **Up** and **Down** navigation buttons to select a language and press **Enter**.

Figure 2-57 Languages Screen

2.10.6 CU Alarm Help – Help/Others

These screens display a list of alarms, definitions, and troubleshooting methods. A user can quickly determine the meaning of an alarm by using this list. Use the **Page Up** and **Page Down** buttons to scroll through the screens.

2.10.7 IV Info – Help/Others

This screen shows important information about the controller display unit such as software and hardware versions, the display serial number, power voltage, and available memory.

2.10.8 Controller Info – Help/Others

This screen shows important information about the controller base box such as software and hardware versions, base box serial number, application, and dongle properties.

2.10.9 IV Settings - Help/Others

This screen allows the user to change the backlight time (the time that the controller backlight will remain active before dimming). See Figure 2-58. To change the backlight time, use the following instructions.

1. Press the **IV Settings** button from the context menu.

2. Select the minutes and press **Enter**. The Backlight Time window opens.

Figure 2-58 Backlight Timing Settings

3. Use the navigation buttons to enter a time or select **NO TIMEOUT**. Press Enter to confirm the time entry.

Note: NO TIMEOUT sets the backlight to always remain active. The display never dims on this setting.

4. Use the **Down** navigation button to select the Checkmark button and press Enter to confirm the timing settings.

2.10.10 Export to USB - Help/Others

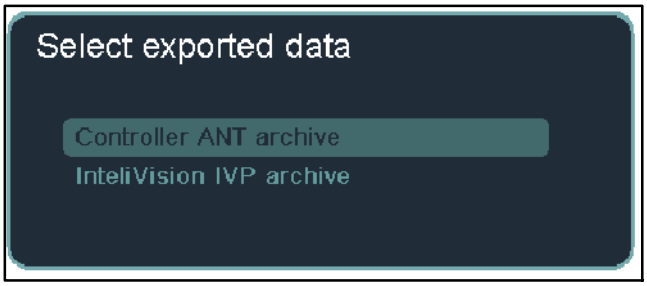
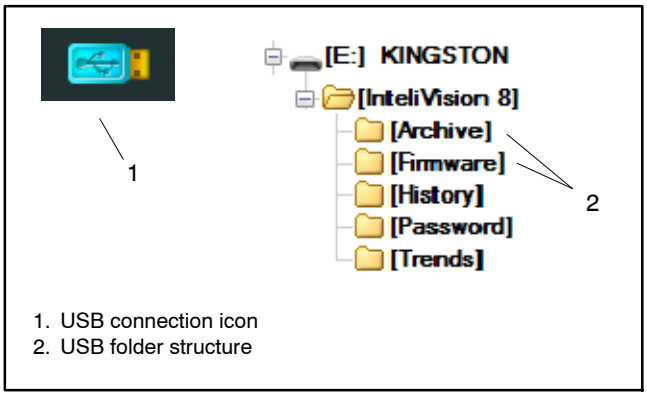


Figure 2-59 Export Window

The Export-to-USB screen in the context menu enables the export of controller archives and display firmware. This export option becomes available in the context menu when a USB device is plugged in. See Figure 2-59.

The archive and the firmware files are exported to a dedicated folder structure, which is created automatically after plugging in the USB stick. See Figure 2-60.



1. USB connection icon
2. USB folder structure

Figure 2-60 USB Features

Controller archive file

The archive file is saved in the ***Archive*** directory and in the following format:
[genset name]-[application name]-[software version].ANT (example: IS-NT-MINT-3.1.2.ANT).

Archive files contain the following data:

- Configuration
- Serial number, Identification string and identification of controller
- Setpoints
- Measurements
- History
- Controller and ECU alarms
- Extension modules list
- Data ID–chip and dongle

Display firmware file

The firmware file is saved in the ***Firmware*** directory and in the following format:
backup-[display version]-[date--time].IVP
(example: backup-2.0-07-11-11--13-58-16.IVP)

Note: The export progress bar displays the export file name and USB folder directory.

Export procedure

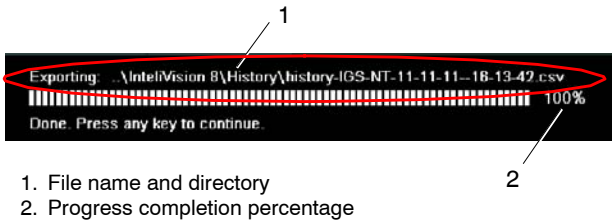
Note: To import setpoints from an archive (.ANT) files, refer to the InteliMonitor Software Manual.

To export an archive or firmware file, use the following steps:

1. Insert a USB stick into the USB-A port. A blue USB icon will appear at the top of the screen.
2. In the Help/Others context menu, press the **Export-to-USB** button. The ***Select Exported Data*** window opens.
3. Select either ***Controller ANT archive*** for the controller archive or ***Intelivision IVP archive*** for the display firmware.
4. Press the **Enter** button to export the file. The USB icon turns red and an export progress bar opens. See Figure 2-61.

Note: When the export is finished the progress bar indicates 100% complete and the USB icon returns to blue.

5. Press any key to close the progress bar.



1. File name and directory
2. Progress completion percentage

Figure 2-61 Export Progress Bar

2.10.11 Setpoint Set

The **Setpoint Set** button allows a user to save the current setpoint parameters as the default settings in the controller and also to revert to the default settings.

Changing the default setpoint parameters is only available to user's with administrator's rights; however, any user with level 1 access or higher can reset the parameters to the default settings.

When a user wants to reset setpoints parameters to the default and the archive or the configuration table has been changed, the following message appears:

Default parameters differ from parameters in the actual configuration table. Please confirm to reset the parameters.

If the user confirms the warning message, only values of identical setpoints from the new and the old configuration table will be reset.

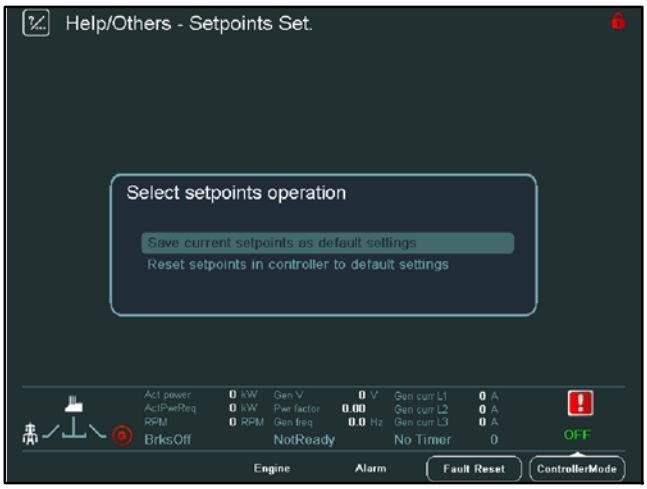


Figure 2-62 Progress Bar and Display Restart

Saving new default settings:

1. Select the **Setpoints Set** button.
2. Choose ***Save current setpoints as default settings*** in the dialog box.

   Note: Only an administration level password can access this function.

3. Confirm the message ***Save current setpoints as default?*** in pop up window to save all data.

Resetting to default settings:

1. Switch the controller to OFF MODE and deactivate the Access lock

Note: If the controller is not in OFF MODE or if Access lock is active, a warning message appears.

2. Select the **Setpoints Set** button.
3. Choose **Reset setpoints in controller to default settings**.

   Note: A user can only reset to the default unlocked parameters or parameters at his password level.

4. Confirm the message ***Do you really want to reset setpoints in controller to default settings?***, to reset all setpoints parameters.
5. The confirmation message, ***Setpoints relating to user's password level have been set to default settings.***, appears in pop up window.

2.10.12 Firmware update

Display firmware can be updated through the USB-A port with the use of the **Firm. Update** button. To update the firmware, refer to the procedure in the controller service manual.

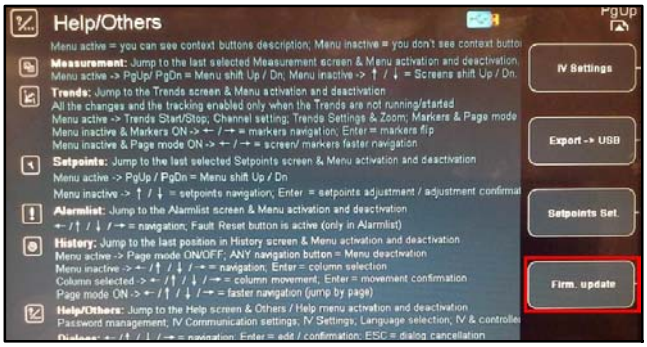


Figure 2-63 Firmware Update Button

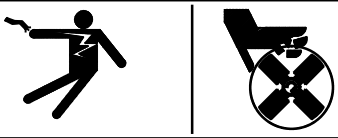
3.1 Safety Precautions

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER



Hazardous voltage. Moving parts.
Will cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

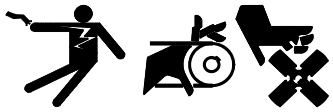
⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

3.2 Introduction

The Decision-Maker® 8000 has many connection options for importing, exporting, monitoring, and messaging. The content in this section contains the specifications and setpoints for connecting and communicating with the Decision-Maker® 8000 controller.

- For monitoring software with a PC, use InteliMonitor, WebSupervisor, or an internet browser.
- For monitoring with a Modbus® master, use Modbus® monitoring software.

The Decision-Maker® 8000 supports connection through USB, Ethernet, RS-232, and RS-485 connection ports.

See Figure 3-1 for recommended cable specifications and Figure 3-2 for communication port locations in the control panel.

- USB-A port is located on the front of the top panel.
- A USB-B port is accessible in the customer connection area of the bottom panel.
- Ethernet RJ-45 is accessible in the customer connection area of the bottom panel.
- RS-232 is accessible on the base box in the middle panel.
- RS-485 is accessible on the base box in the middle panel.
- CAN communication for generator-to-generator paralleling applications (communicating with other controllers) is located on the customer connection terminal block (TB1).

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

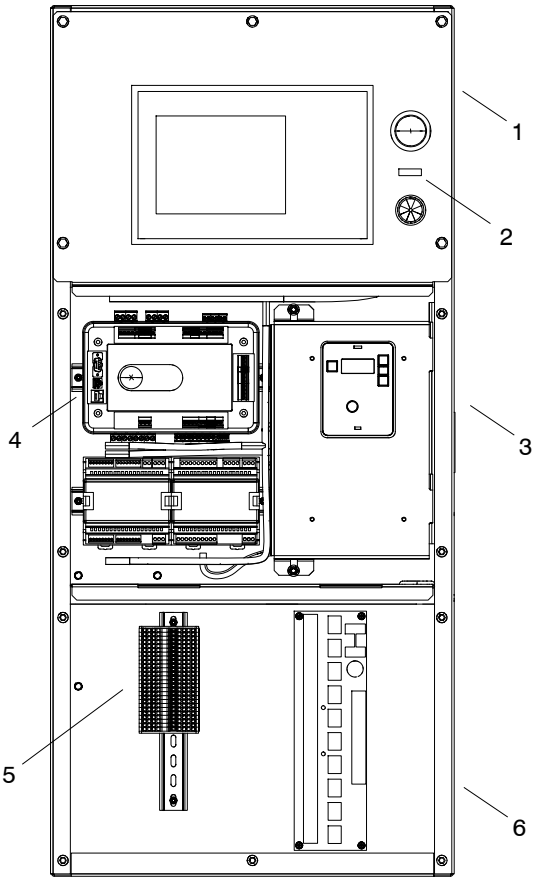
This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

Modbus® is a registered trademark of Schneider Electric.

Interface	Cable	Connector	Max. Length	Max. Speed
USB	Standard USB A-B cable	USB-A-USB-B	5 m (16.4 ft)	115200 Bd
RS-232	Serial cross-wired cable, standard null-modem cable	DB 9 Male Pinout	10 m (32.8 ft)	57.6 kBd
RS-485	Shield twisted pair	None	1000 m (3280.8 ft)	57.6 kBd
Ethernet	STP or UTP cable	RJ-45	100 m (328.1 ft)	10/100 Mbps

Figure 3-1 Recommended Communication Cables



1. Top panel
2. USB-A port
3. Middle (high voltage) panel
4. Base box
5. Customer connection terminal block (TB1)
6. Bottom panel

Figure 3-2 Communication Port Locations

3.3 USB Connections

The Decision-Maker® 8000 has three USB ports, one USB-A and two USB-B ports. Each port has a specific purpose. Refer to Figure 3-3.

- For connecting with a USB stick, use the USB-A port.
- For connecting to a personal computer (PC) with InteliMonitor or WebSupervisor and for servicing the base box, use the base box USB-B port. Refer to the controller service manual.
- For servicing the controller display, use the USB-B port on the controller display. Refer to the Decision-Maker® 8000 service manual.

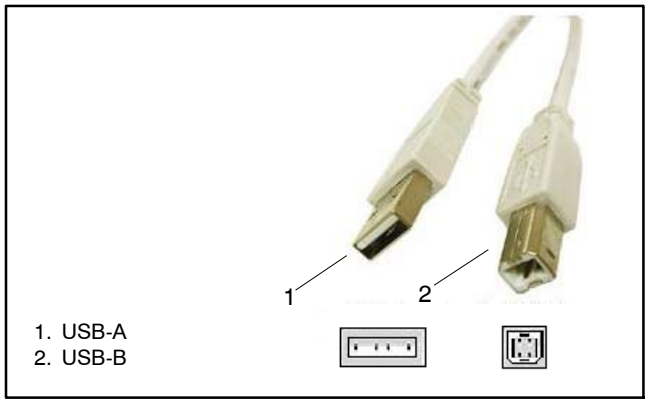


Figure 3-3 USB Port Identification

3.3.1 USB-A Connection Port

The Decision-Maker® 8000 has a USB-A port for data storage and file exports and imports. USB-A features include the following:

- Exporting of event history
- Exporting and importing of Trends data.
- Exporting of firmware archive files for the base box and the display.
- Exporting user password.
- Using USB stick as a login key

When a USB stick is connected to the controller, a USB connection icon appears in the top right corner of the display screen. The USB icon changes colors depending upon status. See Figure 3-4.

- Blue = USB connected
- Red = Data exporting to USB
- Green = Data importing to USB

File imports and exports depend upon very specific file structures and naming conventions. If these file structures do not exist, they are automatically created during the first file export from the controller to the USB stick. See. Figure 3-4. Exports are automatically saved to the corresponding directory and files are automatically named according to the following criteria:

- Type of data (archive, history, password)
- Name of the generator set
- Time stamp, which makes the file unique

For the file name to be correctly generated, the generator set name must contain only alphanumeric characters (examples: 123 or abc). Do not use symbols for the generator set name (examples: !@#$%*+_).

If the file cannot be saved, the error message ***Disk is write protected*** may appear.

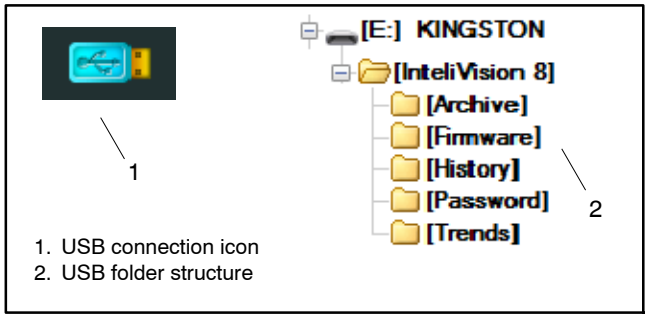


Figure 3-4 USB Features

3.3.2 USB-B Connection Port

DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

The USB-B port on the base box provides a single local connection for connecting a PC or servicing the base box. See Figure 3-2 for the port location. Use this port when monitoring with InteliMonitor software.

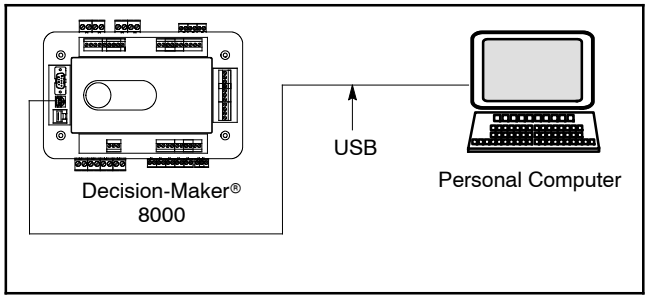


Figure 3-5 Local Single Connections

3.4 RS-232 Connections

The RS-232 port provides a single local connection to a PC or a Modbus® master.

Note: The RS-232, RS-485 converter is included in the controller (no external RS-232, RS-485 converter is needed).

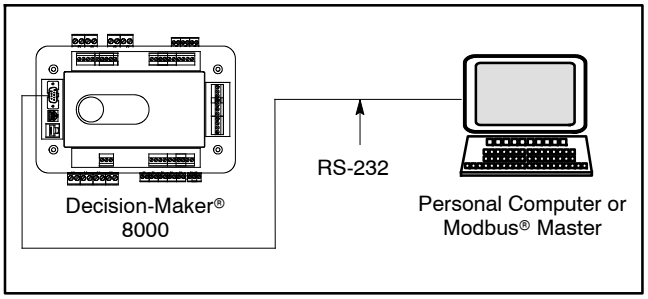


Figure 3-6 RS-232 Single Connection

	PC Equipment	Modbus® Equipment
Controller side	None needed	None needed
Connection type	RS-232 cable up to 10m (32.8 ft.)	RS-232 cable up to 10m (32.8 ft.)
PC side	RS-232 connection or RS232/USB converter	RS-232 connection or RS232/USB converter

Figure 3-7 RS-232 Equipment

When using RS-232 connections, adjust the parameters under the **Comm Settings** setpoint screen on the controller. See Figure 3-6 and Figure 3-8.

Setpoints	PC Parameters	Modbus® Parameters
RS232(1) mode	DIRECT	MODBUS-DIRECT
RS485(2) conv.	DISABLED	DISABLED
RS232(1)MBCSpd	—	9600, 19200, 38400, or 57600

Figure 3-8 Modbus® RS-232 Setpoints

3.5 Modbus RTU with RS-485 Connections

The RS-485 port provides a connection to a PC or a Modbus® master and can be used for monitoring and controlling multiple controllers. RS-485 communication line must be terminated by 120 ohm resistors at both ends. See Section 3.8 for details on RS-485 connections.

Note: RS-485 connection is often used for generator set control over longer distances.

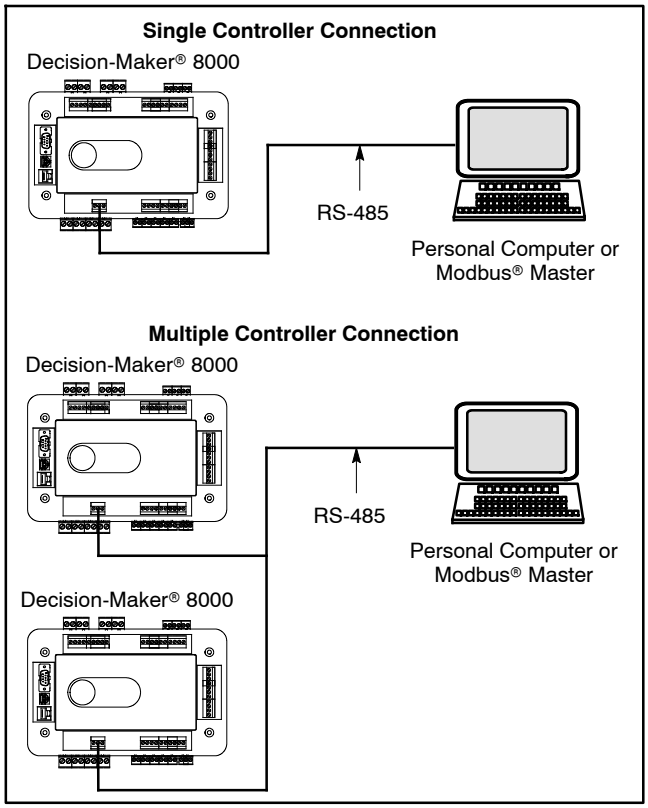


Figure 3-9 RS-485 Single and Multiple Connections

	PC Equipment	Modbus® Equipment
Controller side	None needed	None needed
Connection type	RS-485 cable – Twisted pair, length up to 1 km (3280.1 ft.)	RS-485 cable – Twisted pair, length up to 1 km (3280.1 ft.)
PC side	RS-485, RS-232 converter or RS-485/USB converter	RS-485 connection or RS-485/USB converter

Figure 3-10 RS-485 Equipment

When using RS-485 connections, adjust the parameters under the **Comm Settings** setpoint screen on the controller. See Figure 3-11.

Setpoints	PC Parameters	Modbus® Parameters
RS232(2) mode	DIRECT	MODBUS-DIRECT
RS485(2)Conv.	ENABLED	ENABLED
RS232(2)MBCSpd	—	9600, 19200, 38400, or 57600

Figure 3-11 Modbus® RS-485 Setpoints

Modbus® is a registered trademark of Schneider Electric.

3.6 Ethernet Connections

For connections with Ethernet, either a personal computer or a Modbus® master can be used for monitoring. The address setup and setpoints in Section 3.6.1 apply to all Ethernet connections. See Sections 3.6.2, 3.6.3, and 3.6.4 for any additional specifications or settings for Modbus® and internet connections.

3.6.1 Ethernet Network Addresses and Setpoint Parameters

Use the following parameters in Figure 3-12 and the IP address example in Figure 3-13 for a Local Area Network, Modbus®, or Internet connections (Sections 3.6.2, 3.6.3, and 3.6.4). The setpoints shown can be accessed on the Comms Settings setpoint screen.

Setpoints	Parameters
IP addr mode	Fixed
IP address	192.168.1.254
Net mask	255.255.255.0
Gateway IP	192.168.1.1
ComApProtoPort	23
AirGate	Disabled
AirGate IP	

Figure 3-12 Ethernet Setpoint Parameters

The IP addresses of the controllers must be accessible from the remote computer. If the remote computer is connected into a different LAN segment than the generator sets, there must be a gateway(s) that enable direct traffic between the segments. If the remote computer is connected via the Internet, then the Internet gateway of the LAN where the generator sets are connected must have a public IP address, must allow incoming traffic, and must provide port forwarding from the external public IP to the different internal generator set IPs according to the port used.

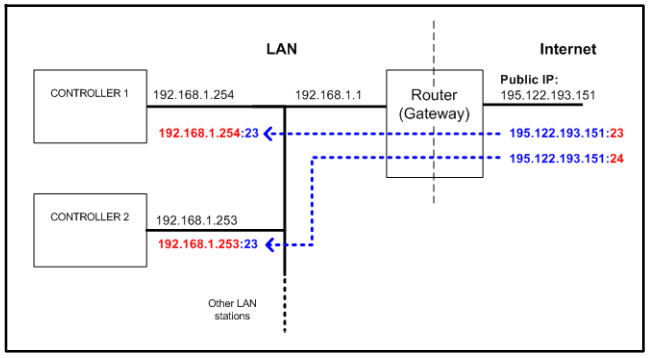


Figure 3-13 Ethernet Configuration Example

3.6.2 Ethernet PC Connections

The Internet (Ethernet) connection is a point-to-point connection between a controller and a PC or site via a TCP/IP protocol-based network. See Figure 3-14. The physical configuration of such a network can be a small local area Ethernet network as well as the Internet. Monitoring is possible via InteliMonitor, WebSupervisor, or a web browser. See Figure 3-15 for required equipment.

Ethernet connection to controller makes using any web browser for basic monitoring and adjustment of the controller possible. Simply put the IP address of the module into the address line in your web browser (for example, http://192.168.1.254) and then enter the access code. When the browser window is closed, there is a 5 minute timeout before the client is automatically logged out.

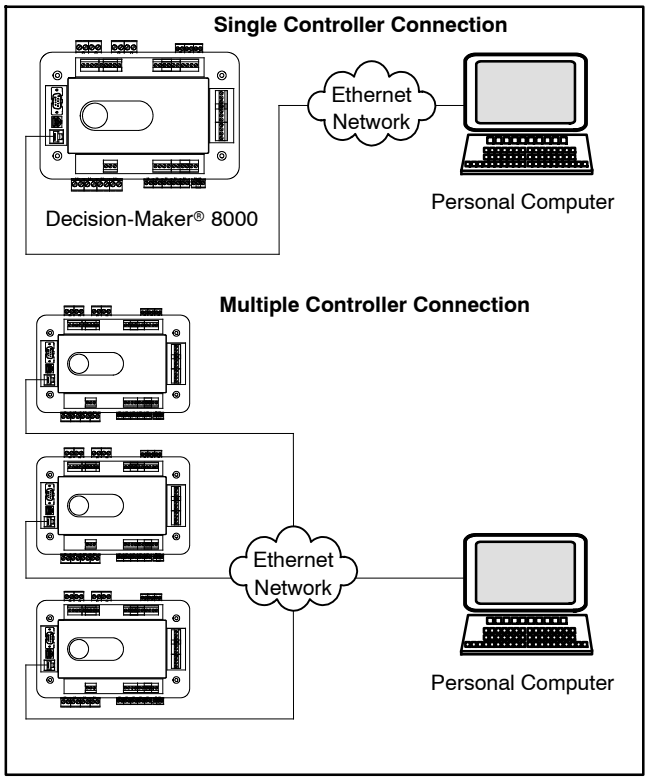


Figure 3-14 Direct Ethernet Connections

Number of clients connected simultaneously:

- 2 clients with InteliMonitor or WebSupervisor
- 2 clients with web interface

	Required Equipment
Controller side	None needed
Connection type	Ethernet cable to LAN, for point to point connection between PC and controller (use cross-wired cable)
PC side	Ethernet connection

Figure 3-15 Ethernet Equipment

Modbus® is a registered trademark of Schneider Electric.

3.6.3 Ethernet Modbus/TCP Connections

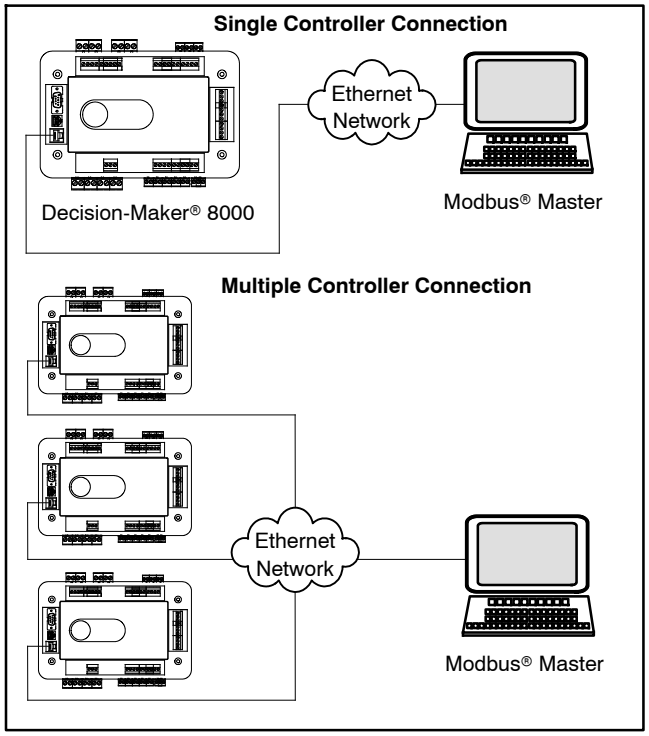


Figure 3-16 Ethernet Modbus®/TCP Connections

	Required Equipment
Controller side	None needed
Connection type	Ethernet cable to LAN, for point to point connection between PC and controller (use cross-wired cable)
PC side	Ethernet connection

Figure 3-17 Ethernet Equipment

Number of clients connected simultaneously:

- 1 client Modbus®/TCP

Every Modbus®/TCP session has to be started with writing the access code from the Modbus®/TCP client to the controller. If the session is closed and reopened again, the access code must be rewritten. If the session is not closed manually, the controller closes the session automatically after 15 seconds if there is no activity from the client side. See Figure 3-16 for the connection diagram and Figure 3-17 for equipment requirements.

There are dedicated registers for entering the access code via Modbus©/TCP. The register numbers are 46339–46346 (register address 6338–6345). Using the register address 24535 works as well.

The following is an example of the Modbus® message (in HEX):
01 10 18 C2 00 08 10 30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FE F3

Code	Definition
01	Controller address
10	Modbus® function (16dec – Write multiple registers)
18C2	Register address (18C2hex = 6338dec = register 46339)
0008	Number of registers
10	Length of the data (Number of registers x 2B)
30000000...	Access code string (16 chars, null-terminated, ASCII, here “0”)
FEF3	CRC

Figure 3-18 Modbus® Message Breakdown

3.6.4 Ethernet Internet Connections

For connection settings, see Figure 3-12 and Figure 3-13. For the connection diagram, see Figure 3-19

Ethernet connection to controller makes using any web browser for basic monitoring and adjustment of the controller possible. Simply put the IP address of the module into the address line in your web browser (for example, http://192.168.1.254) and then enter the access code. When the browser window is closed, there is a 5 minute timeout before the client is automatically logged out.

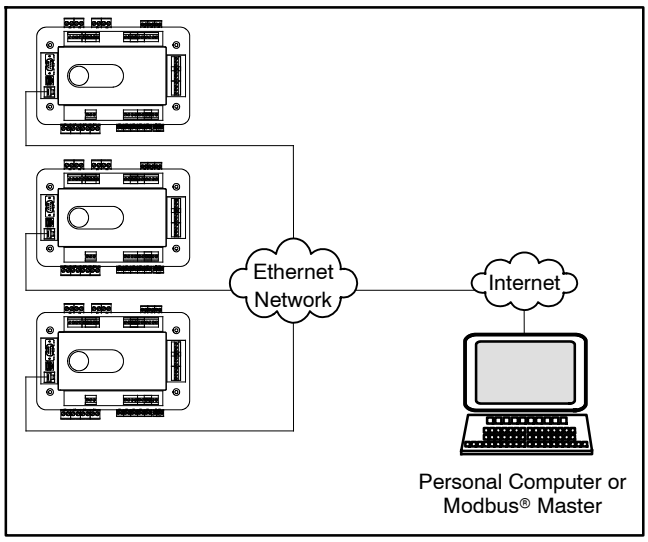


Figure 3-19 Internet Connections

Number of clients connected simultaneously:

- 2 clients with InteliMonitor or WebSupervisor
- 1 client Modbus®/TCP
- 2 clients with web interface

Modbus® is a registered trademark of Schneider Electric.

3.7 E-mail and SMS Alerts

The Decision-Maker® 8000 provides several ways for sending alerts and messages for monitoring the generator set. The following instructions show the specifications for sending notifications by e-mail and text messaging.

Note: For modem connections, connect to the RS-232 port.

3.7.1 Active Call

When an alarm (warning, shut–down) initiates an active call, the controller calls the preselected telephone number and sends the ANT archive file (See p. 50 for archive file information). For required equipment, see Figure 3-20; for setpoints, see Figure 3-21.

Note: For Active call to work properly, the controller must be connected by RS-232 port to a modem and InteliMonitor software must be running on the PC side and waiting for active call.

Note: The same type of modem should be used for both the controller and the PC. For example, combining an analog and GSM modem is not recommended.

	Required Equipment
Controller side	Analog, ISDN or GSM modem
Connection type	Phone line or GSM
PC side	Analog, ISDN or GSM modem

Figure 3-20 Active Call Equipment

See Figure 3-21 for the setpoint parameters. The setpoints shown can be accessed on the Act. calls/SMS screen.

Setpoints	Parameters
AcallCH1(-3)-Type	DATA
AcallCH1(-3)-Addr	telephone number

Figure 3-21 Active Call Setpoints

3.7.2 Active SMS

When an alarm (warning, shut–down) initiates an active SMS, the controller sends an SMS message to the predefined GSM number (See Figure 2-59 for archive file information). For required equipment for Active SMS, see Figure 3-22.

The maximum length of the SMS is 70 characters. The following SMS example would be sent if the primary water temperature exceeded the warning limit and Emergency stop input has been deactivated:
#Gen–set name:AL=(Wrn PrimWater temp, Emergency stop).

	Required Equipment
Controller side	GSM modem
Connection type	GSM
PC side	GSM Mobile Phone

Figure 3-22 Active SMS Equipment

Note: For Active call to work properly, the controller must be connected by RS-232 to a GSM modem and the mobile phone must be able to receive GSM messages.

See Figure 3-23 for the setpoint parameters. The setpoints shown can be accessed on the Act. calls/SMS setpoint screen.

Setpoints	Parameters
AcallCH1(-3)-Type	SMS
AcallCH1(-3)-Addr	mobile phone number
Acall+SMS lang	1, 2, 3,...

Figure 3-23 Active SMS Setpoints

3.7.3 Active E-mail

When an alarm (warning, shut–down) initiates an active e-mail, the controller sends an e-mail message to a predefined e-mail address. See Section 3.6 for Ethernet connections. For required equipment for Active E-mail, see Figure 3-24.

	Required Equipment
Controller side	Ethernet connection
Connection type	Internet
PC side	Ethernet connection, e-mail message box

Figure 3-24 Active E-mail Equipment

See Figure 3-25 for the setpoint parameters. The setpoints shown can be accessed on the Act. calls/SMS screen.

Setpoints	Parameters
AcallCH1(-3)-Type	IB-E-MAIL
AcallCH1(-3)-Addr	email address (maximum length of email address is 31 characters)
Acall+SMS lang	1, 2, 3,...

Figure 3-25 Active E-mail Setpoints

3.8 Modbus Communications

The controller communicates using Modbus® as a slave connection with the Modbus® master initiating the communication. The controller seeks the system and alternator parameters and diagnostic information then responds back to the Modbus® master. In addition, the controller accepts information to alter controller parameters including generator set starting and stopping. See Figure 3-26. Refer to the Modbus® Communication Protocol Operation Manual in the List of Related Material, Figure 1.

Note: Only one Modbus® master can be connected to the controller. Examples include the remote serial annunciator and switchgear applications.

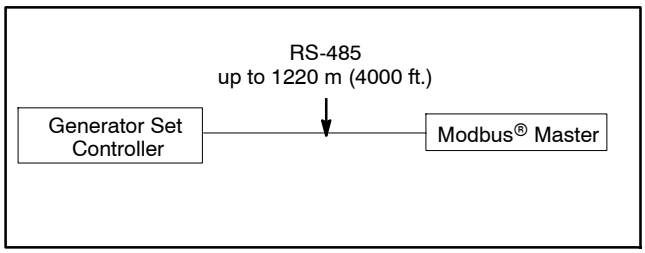


Figure 3-26 Modbus® Connections

3.9 RS-485 Connections

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

Use the following rules when connecting RS-485:

- The effective maximum length is 1000 m (3281).
- The RS-485 connections must be wired in linear form. No nodes are allowed except on the controller terminals. External units can be connected in any order as long as the units are connected linearly (daisy-chain).
- Shielded cable should be used and the shielding should be connected to a protected earth ground on one side (controller side).
- RS-485 line has to be terminated by 120 ohm resistors on the both ends. See Figure 3-30.
- Always check the number and placement of terminating resistors in the RS-485 line, only correct wiring ensures reliable operation! The correct number of resistors must be used! The correct number can be checked using an Ohmmeter. When power for ALL devices on the RS-485 line is switched off, the resistance measured between A and B wire should be 60 Ohms. Connecting the COM terminals between all controllers is recommended. Connect the cable shielding to ground at only one point.

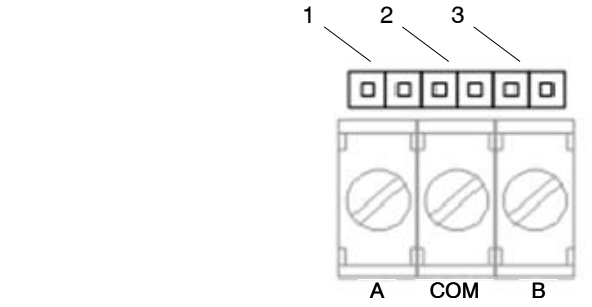
Note: Termination resistors for the RS-485 connections are already implemented on the controller base box. To connect the resistor, close the jumper near the appropriate RS-485 terminal. Refer to Figure 3-28.

- Recommended data cables:
  - For shorter distances: 3105A
  - For longer distances: 3106A
  - In case of surge hazard: 3106A
  - Other acceptable Belden cables: 9841
- Use a cable with following parameters:

Cable type	Shielded twisted pair
Impedance	120 Ω
Propagation velocity	>=75% (delay <= 4.4 ns/m)
Wire crosscut	>= 0.25 mm^2
Attenuation (@1MHz)	<= 2dB/100 m

Figure 3-27 Cable Parameters

Modbus® is a registered trademark of Schneider Electric.



1. Jumper for 620 Ω pull-up resistor
2. Jumper for120 Ω terminating resistor
3. Jumper for 620 Ω pull-down resistor

Figure 3-28 RS-485 Jumper connection

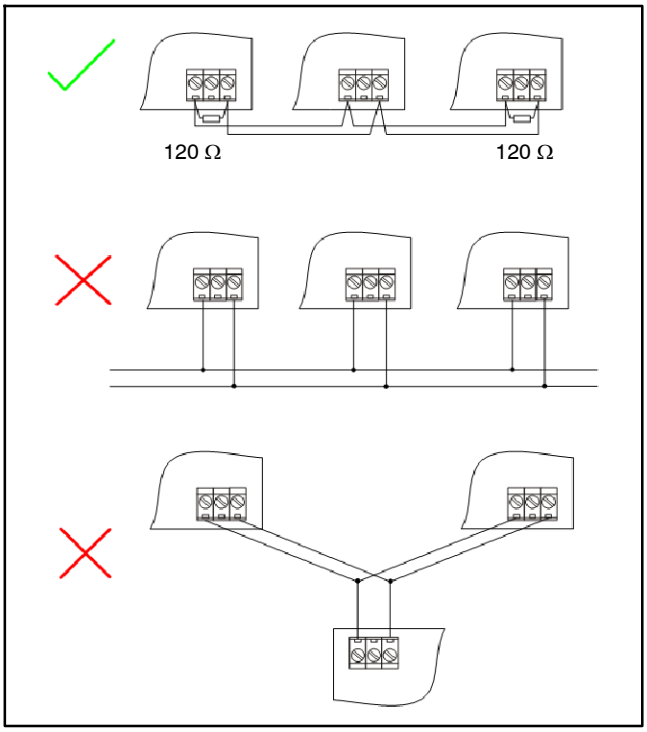


Figure 3-29 Connection Examples

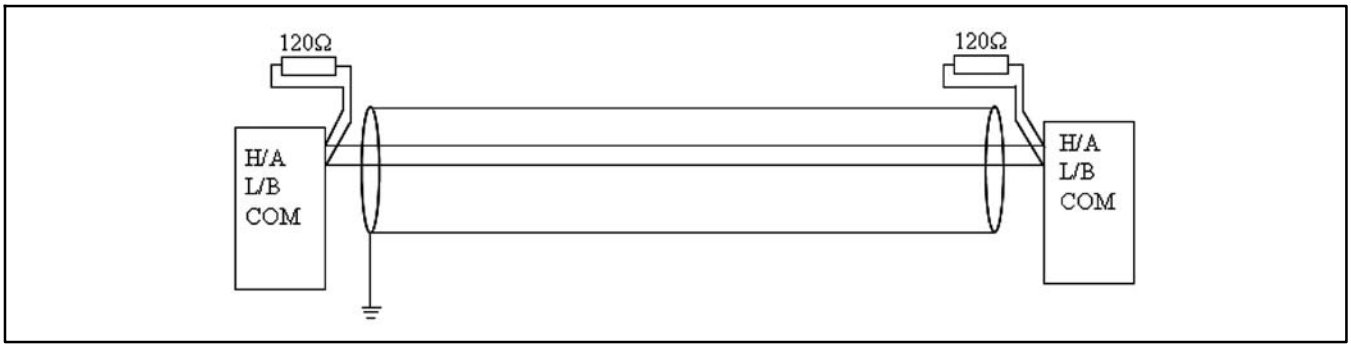


Figure 3-30 Termination Resistors

3.9.1 Optical Isolation

In some cases, using the optical isolation of the RS-485 line is necessary. The controller base box has embedded optical isolation on RS-485 port 2; however, some installations may need additional equipment to ensure the required separation. The need of galvanic separation depends on distance between the nodes and surrounding transmission line(s). See Figure 3-31.

Surrounding/Powersupply	Distance between two nodes / the need of galvanic separation		
	<15 m (49 ft.)	15 m - 100 m (49 ft. - 328 ft.)	>100 m (328 ft.)
Same power supply, No disturbance	no optical isolation	on one end	on one end
Same power supply, High disturbance	on one end	on both ends	on both ends
Different power supply, No disturbance	on one end	on one end	on both ends
Different power supply, High disturbance	on both ends	on both ends	on both ends

Figure 3-31 Optical Isolation Chart

3.9.2 Termination Resistors

Because each differential pair of wires is a transmission line, you must properly terminate the line to prevent reflections. A common method of terminating a two-wire multidrop RS-485 network is to install terminating resistors at each end of the multidrop network. If you daisy-chained multiple instruments together, you need a terminating resistor at only the first and last instruments. The terminating resistor should match the characteristic impedance of the transmission line (typically 100–120 Ohms).

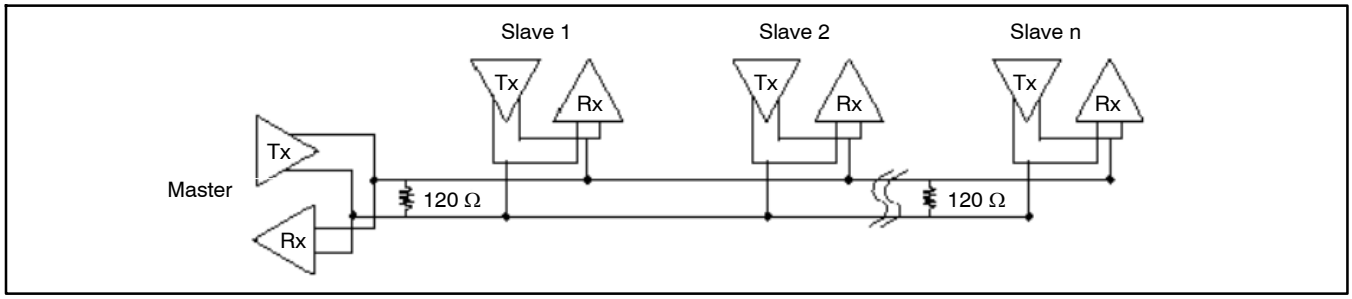


Figure 3-32 RS-485 Termination Resistor

3.9.3 Bias Resistors

The transmission line into the RS-485 port on the controller base box enters an indeterminate state when it is not being transmitted to. This indeterminate state can cause the receivers to receive invalid data bits from the noise picked up on the cable. To prevent these data bits, you should force the transmission line into a known state. By installing two 620 Ohm bias resistors at one node on the transmission line, you can create a voltage divider that forces the voltage between the differential pair to be less than 200 millivolts, the threshold for the receiver. Install these resistors on only one node. The figure below shows a transmission line using bias resistors. Bias resistors are placed directly on the printed circuit board of the controller. Use jumpers PULL UP / PULL DOWN to connect the bias resistors.

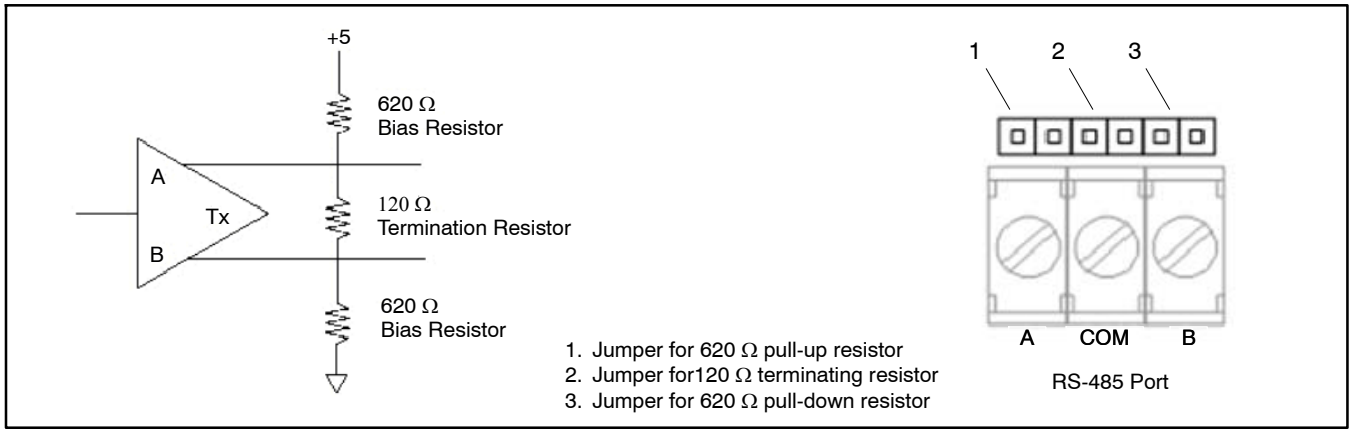


Figure 3-33 RS-485 Bias Resistor

3.10 Connecting CAN Bus Communication between Controllers

Read the following to determine how to connect the CAN bus wiring and to change controller settings for CAN bus communication. CAN bus communication is used primarily for paralleling applications.

The CAN2 port on the controller base box connects to TB1. Connect to the CAN communication terminals located on the customer connection terminal block (TB1).

Note: The CAN1 port on the controller base box connects to the generator and engine control network and is not used for customer connections. This network includes modules for control of the engine, the controller base box, analog input module, and input/output module. This network is not intended for connection to external modules or devices.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Accessing the middle compartment on the control panel. Hazardous voltage will cause severe injury or death. On the controller base box and automatic voltage regulator, do not touch the terminals for voltage and current measurement. Disconnect all power sources and disable the generator set before servicing.

3.10.1 CAN Bus Connections

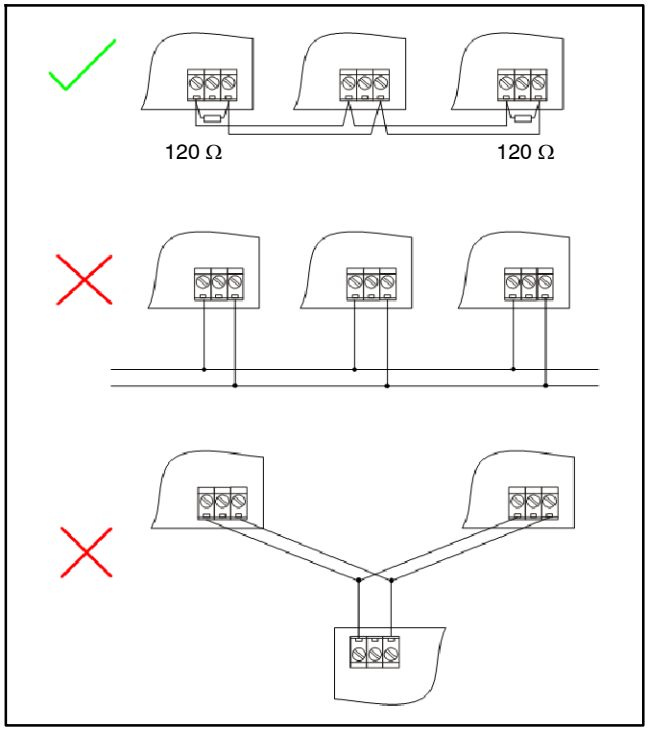
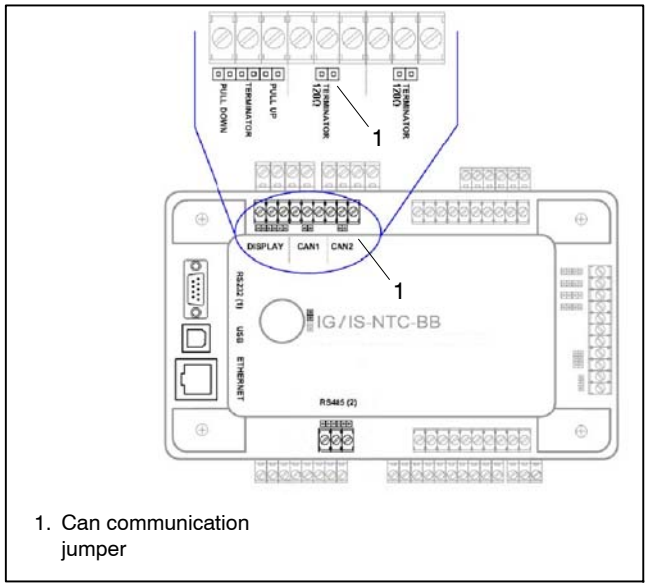


Figure 3-34 CAN Bus Connection Examples



1. Can communication jumper

Figure 3-35 Base Box Jumper Locations

Note: Termination resistors are already implemented on the CAN2 port on the controller base box. For connecting, close the jumper near CAN2 port. See Figure 3-35.

Use the following rules when connecting to the CAN2 port:

- The CAN bus must be wired in linear form. No nodes are allowed except on the controller terminals. External units can be connected in any order as long as the units are connected linearly (daisy-chain).
- Shielded cable should be used. Shielding must be connected to a physical earth ground at only one point.
- The CAN bus must be terminated by 120 ohm resistors on the both ends. See Figure 3-30.
- The maximum length of CAN bus depends on the communication speed.
  - For a speed of 250 kbps, change the **CAN BUS MODE** setpoint parameter to 32C. Use this parameter for distances shorter than 200 m (656 ft.).
  - For a speed of 50 kbps, change the **CAN BUS MODE** setpoint parameter to 8C. Use this parameter for longer distances up to 900 m (2953 ft.).

  Note: Set all connected controllers to the same speed.

  Note: **CAN BUS MODE** is a setpoint under the Comms settings group.
- Recommended data cables:
  - For shorter distances: 3105A
  - For longer distances: 3106A
  - In case of surge hazard: 3106A
  - Other acceptable Belden cables: 9841
- Use a cable with following parameters:

Cable type	Shielded twisted pair
Impedance	120 Ω
Propagation velocity	>=75% (delay <= 4.4 ns/m)
Wire crosscut	>= 0.25 mm^2
Attenuation (@1MHz)	<= 2dB/100 m

Figure 3-36 Cable Parameters

3.10.2 Wiring Examples

- For shorter distances (all network components within one room), see Figure 3-37.
  - interconnect A and B
  - Connect shielding to physical earth ground at one controller.
- For longer distances (connection between rooms within one building), see Figure 3-38.
  - Interconnect A and B.
  - Interconnect COM (do not ground)
  - Connect shielding to physical earth ground at one controller.
- In case of surge hazard (connection out of building in case of storm etc.), see Figure 3-39.

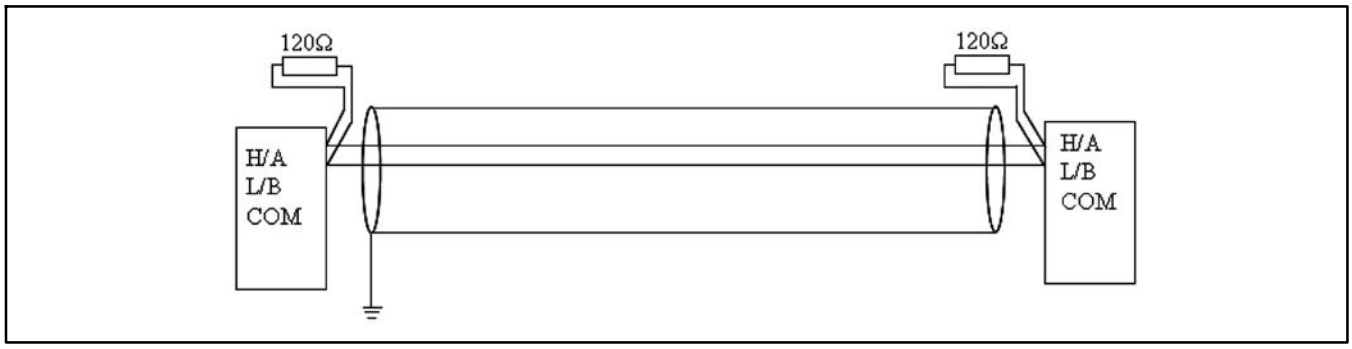
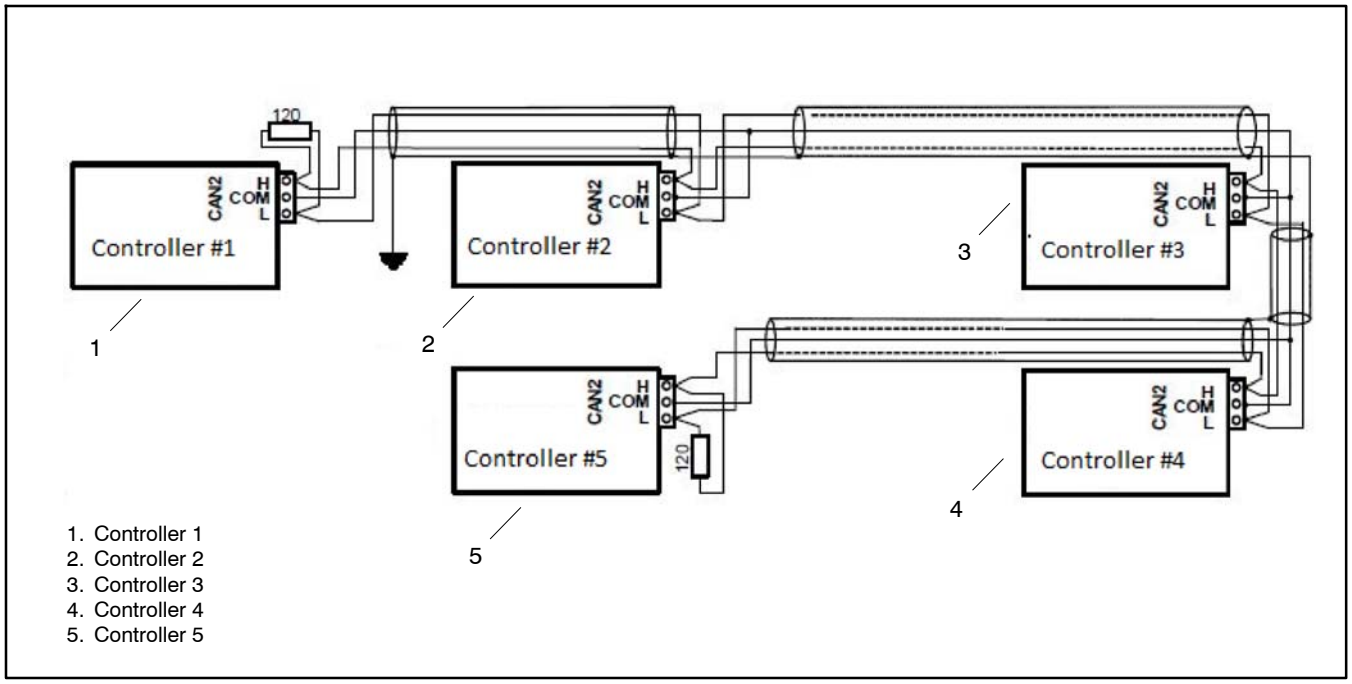
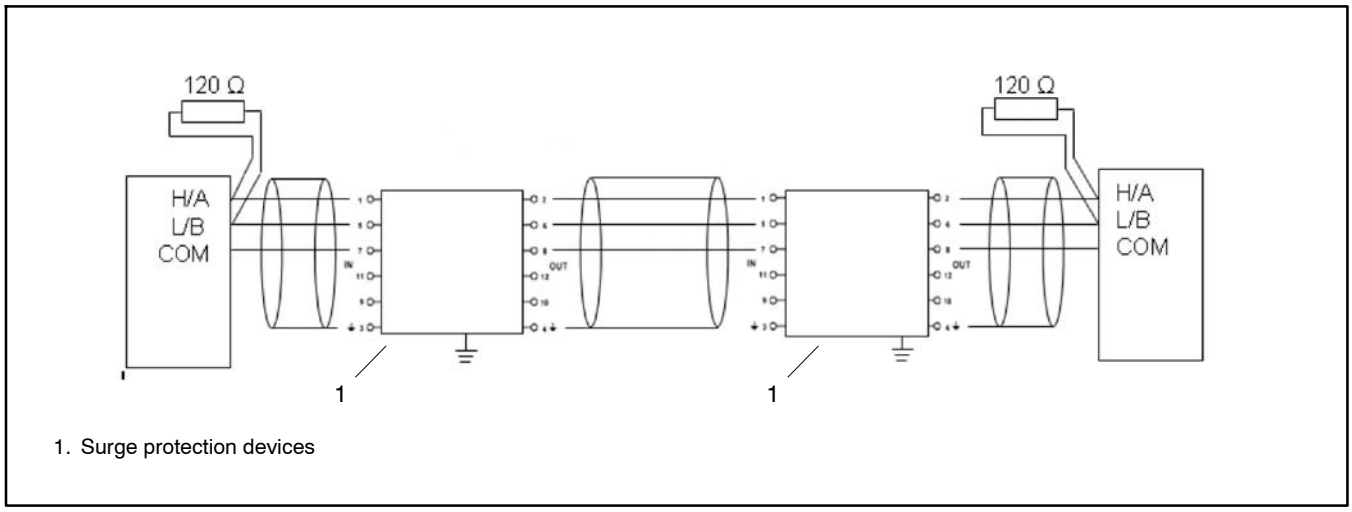


Figure 3-37 Shorter distances (All network components within one room)



1. Controller 1
2. Controller 2
3. Controller 3
4. Controller 4
5. Controller 5

Figure 3-38 Longer distances (Connections between rooms within one building)



1. Surge protection devices

Figure 3-39 Surge hazard (Connection out of building in case of storm etc.)

3.11 Monitoring Software

Monitoring software is shipped with the product and is also available for download. See the following software descriptions and the List of Related Literature, Figure 1.

3.11.1 InteliMonitor

InteliMonitor software allows a user to monitor and change settings on the Decision-Maker® 8000 with a personal computer. For information on using Intelimonitor, refer to the Intelimonitor User's Manual. See the List of Related Literature. Use the USB-B port when connecting to the controller with InteliMonitor.

InteliMonitor features include:

- On-line direct, Internet single or multiple engine monitoring
- Active Modem or Internet call from the controller to PC (activated by selected Alarm)
- On-line or Off-line History record listing
- Setpoints listing and adjusting (password protected)
- Statistics value (for example, Running hours) Set/Reset
- Password and Access code change

3.11.2 WebSupervisor

WebSupervisor is a web based system designed for monitoring and controlling the Decision-Maker® 8000 via the internet. This system offers a number of beneficial features that help optimize revenue for machinery fleets, as each piece of equipment can be individually monitored for all important operation values.

For information on using WebSupervisor, refer to the WebSupervisor User's Manual. See the List of Related Literature, Figure 1.

When connecting the controller to a direct Ethernet port, the controller has to have fixed and public IP address. Connect and set the controller the same way as for Ethernet Connection (Direct).

Connecting

1. Connect the Decision-Maker® 8000 to the Internet.
2. To verify that the internet connection is OK, connect to the controller using InteliMonitor.
3. Open Internet Browser and enter the following address: http://websupervisor.comap.cz
4. Login into WebSupervisor with your account.
   a. If you do not have an account, see the information for ***Registering and logging in***.
   b. Register the new unit with WebSupervisor.
5. Start using WebSupervisor in accordance with WebSupervisor manual.

Registering and logging in

1. Open http://websupervisor.comap.cz/ in your browser. The WebSupervisor homepage appears. See Figure 3-40.

2. Insert your login name and password into field LOGIN NAME and PASSWORD. See Figure 3-40.

Figure 3-40 WebSupervisor Home Page

3.11.3 Web Interface

The web interface is intended to monitor the controller from a web browser. A static IP address is required for this function as the IP address must be placed into the browser. A public IP address or port forwarding is required if you want to see the web pages from the Internet. See Figure 3-41.

The web server is designed for basic monitoring and adjustment of the controller using a web browser. When the Controller IP address is placed into a browser, you will be asked for the controller access code.

Note: The web server is optimized for IE6 or higher and screen resolution of 1024x768 pixels.

Note: Do not use the browser navigation buttons as ***Back***, ***Forward*** or ***Reload***. Use the links and the reload button located in the toolbar instead.

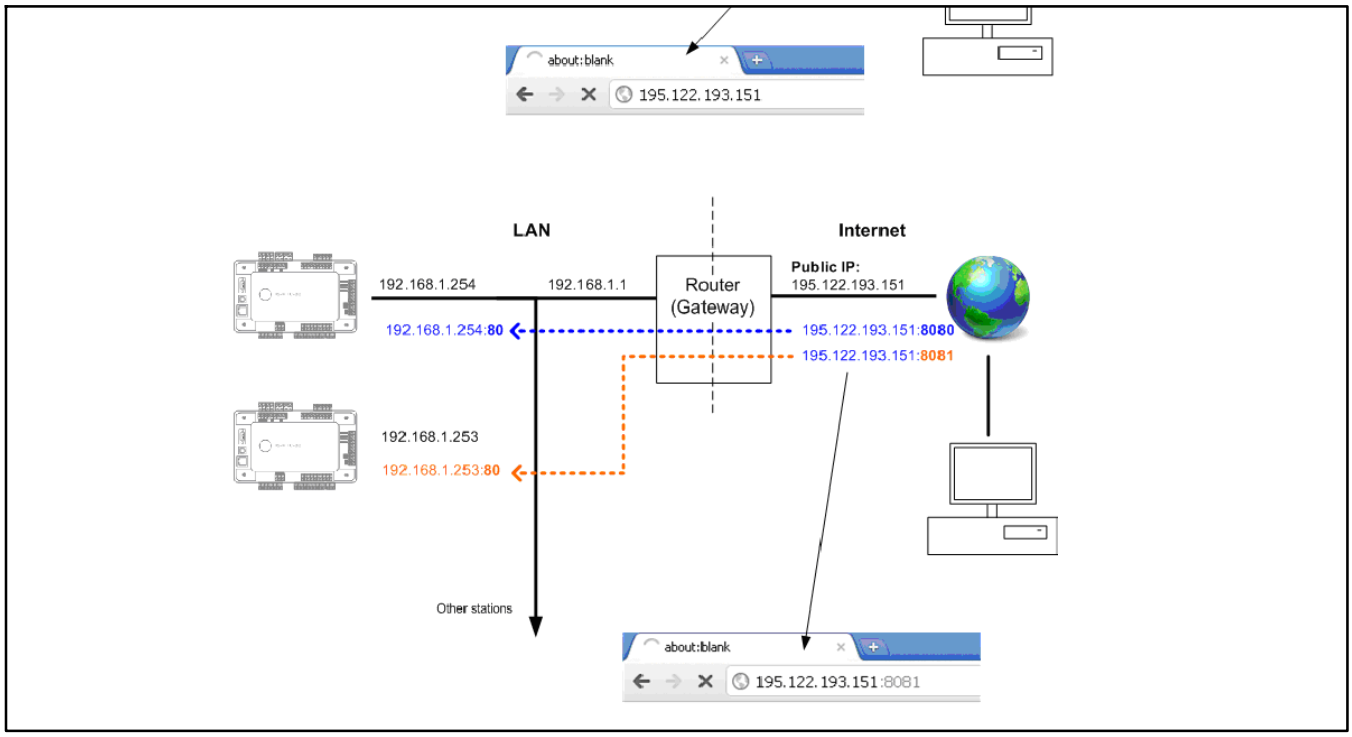


Figure 3-41 Port Forwarding Example

SCADA Page

Click to the SCADA link in the toolbar to display the SCADA page. The SCADA page is also the default page when you put the controller address into the browser. See Figure 3-42.

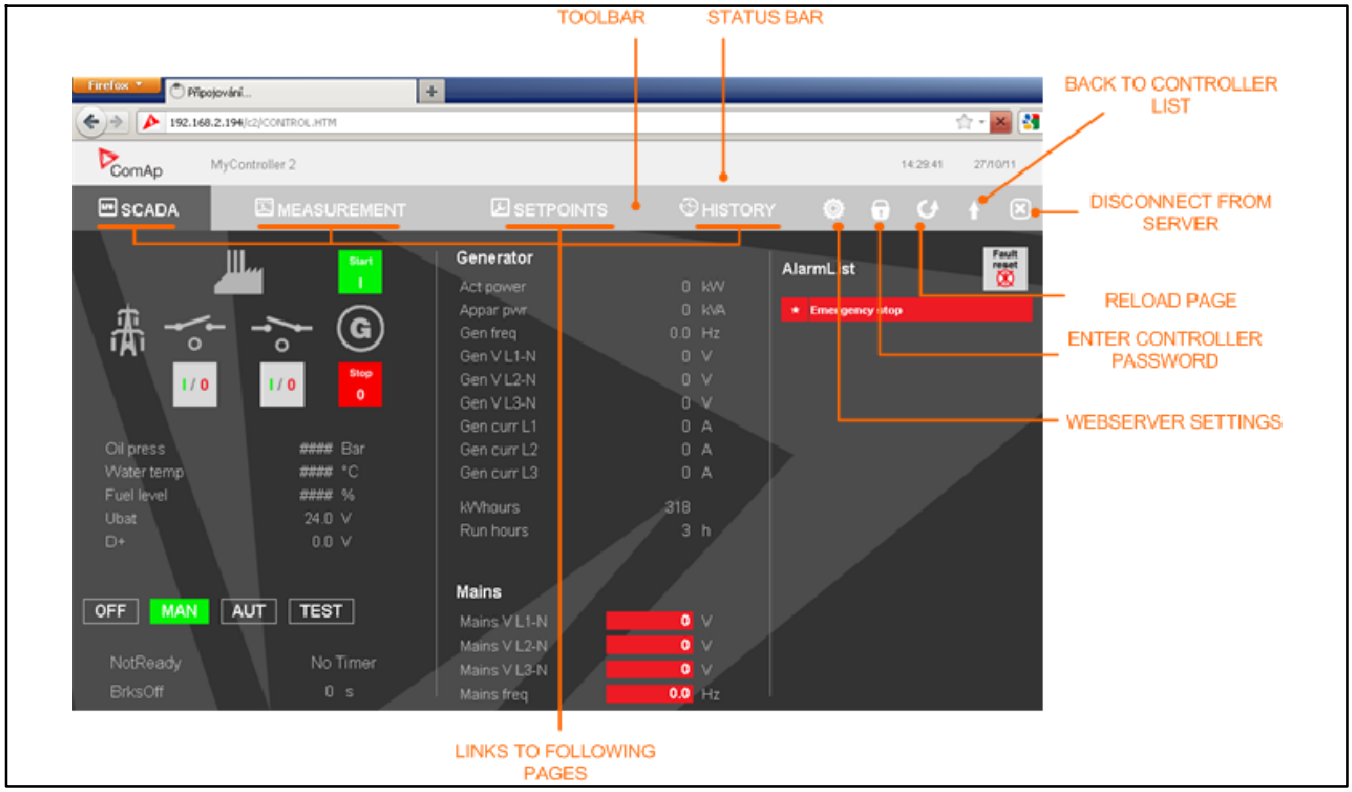


Figure 3-42 Scada Page Overview

Measurement Page

Click the MEASUREMENT link in the toolbar to display the measurement page. See Figure 3-43.

On the Measurements page, select the name under Groups on the left column. The values for the selected group will be displayed in the right column.

Note: The measurement page is automatically refreshed every 60 seconds.

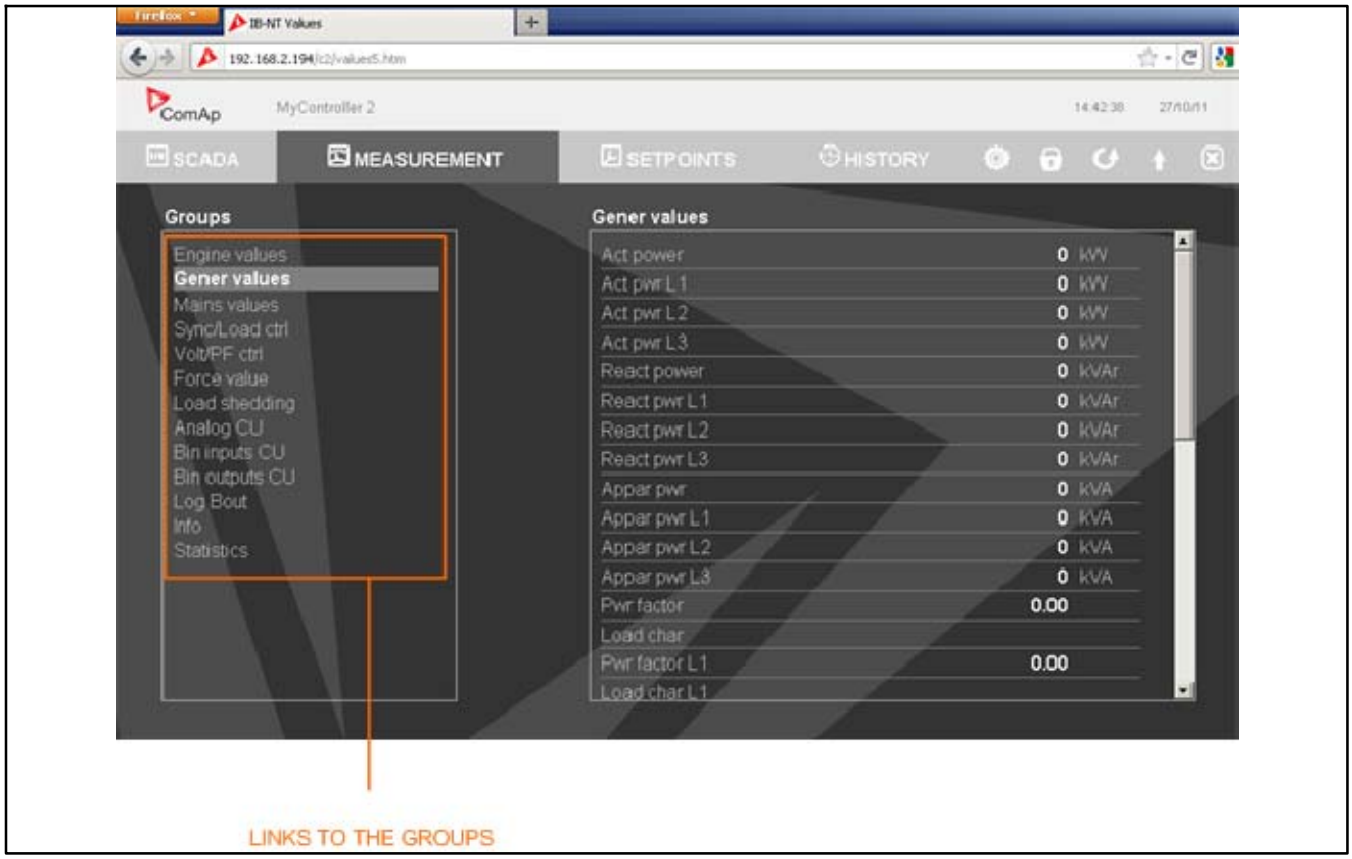


Figure 3-43 Scada Measurement Page Overview

Setpoints Page

Click to the SETPOINTS link in the toolbar to display the setpoints page. See Figure 3-44.

On the Setpoints page, select the name under Groups on the left column. The setpoints for the selected group will be displayed in the right column.

To change the setpoint value, click to the setpoint name or value. If the selected setpoint is password protected, which is indicated by a lock icon by the setpoint name, click on the ***Change Password*** icon located in the toolbar and then enter the valid password.

Note: The setpoint page is automatically refreshed every 60 seconds. If a second user changes a setpoint from another terminal, the web page will not show this change immediately as in InteliMonitor.

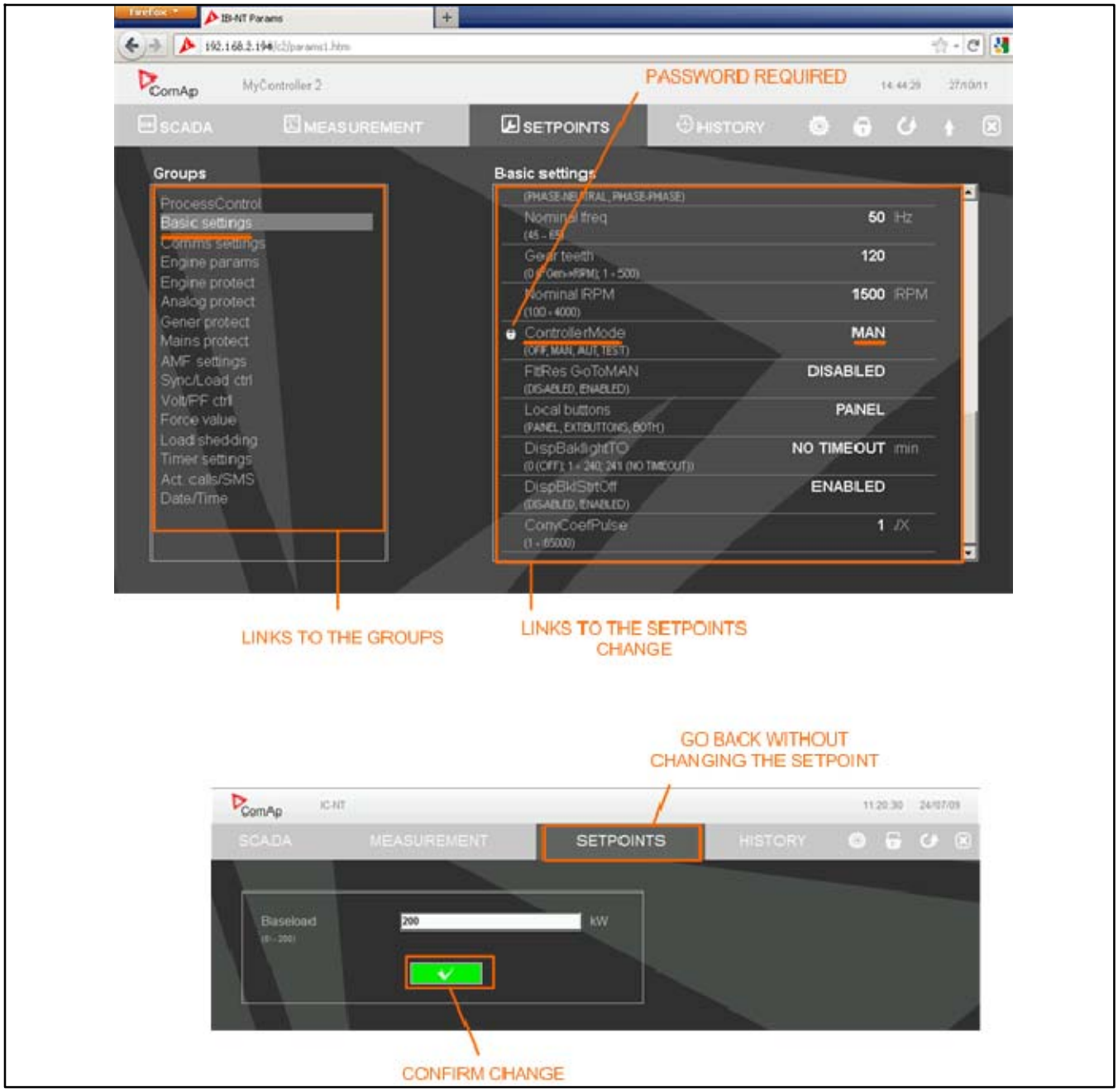


Figure 3-44 Scada Setpoint Page Overview

History Page

Click to the HISTORY link in the toolbar to display the history page. See Figure 3-45.

Use the control buttons to move within the history file.

Note: The history page refreshes automatically every 5 minutes. If a new record appears in the controller, the web page will not show it immediately as in InteliMonitor.

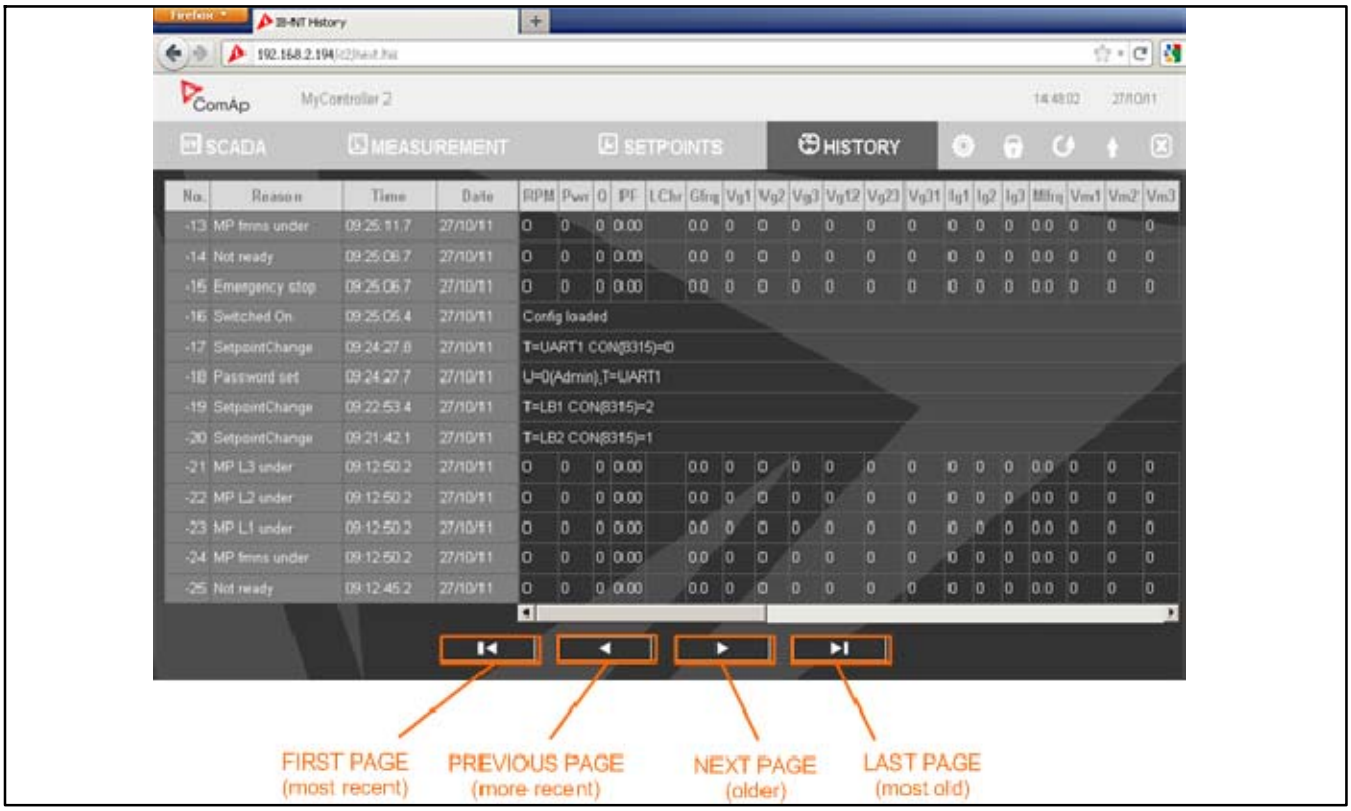


Figure 3-45 Scada History Page Overview

Notes

4.1 Prestart Checklist

To ensure continued satisfactory operation, perform the following checks or inspections before or at each startup, as designated, and at the intervals specified in the service schedule. In addition, some checks require verification after the unit starts.

Air Cleaner. Check for a clean and installed air cleaner element to prevent unfiltered air from entering engine.

Air Inlets. Check for clean and unobstructed air inlets.

Battery. Check for tight battery connections. Consult the battery manufacturer's instructions regarding battery care and maintenance.

Coolant Level. Check the coolant level according to the cooling system maintenance information.

Note: Block Heater Damage. The block heater will fail if the energized heater element is not immersed in coolant. Fill the cooling system before turning on the block heater. Run the engine until it is warm, and refill the radiator to purge the air from the system before energizing the block heater.

Drive Belts. Check the belt condition and tension of the radiator fan belt.

Exhaust System. Check for exhaust leaks and blockages. Check the silencer and piping condition and check for tight exhaust system connections.

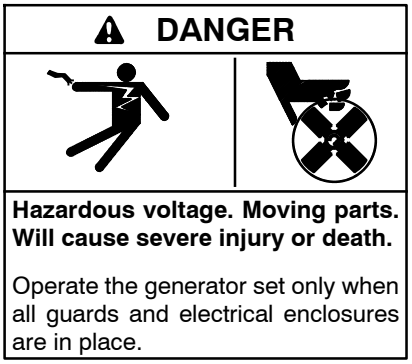
Inspect the exhaust system components (exhaust manifold, exhaust line, flexible exhaust, clamps, silencer, and outlet pipe) for cracks, leaks, and corrosion.

- Check for corroded or broken metal parts and replace them as needed.
- Check for loose, corroded, or missing clamps and hangers. Tighten or replace the exhaust clamps and/or hangers as needed.
- Check that the exhaust outlet is unobstructed.
- Visually inspect for exhaust leaks *(blowby)*. Check for carbon or soot residue on exhaust components. Carbon and soot residue indicates an exhaust leak. Seal leaks as needed.

Oil Level. Maintain the oil level at or near, not over, the full mark on the dipstick.

Operating Area. Check for obstructions that could block the flow of cooling air. Keep the air intake area clean. Do not leave rags, tools, or debris on or near the generator set.

4.2 Exercising the Generator Set



Servicing the generator set when it is operating. Exposed moving parts will cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Exercising the generator set allows the operator to inspect the generator set under load and to ensure that unit is in good working condition. Operate the generator set under load once each week for one hour. Check local and state codes for additional exercise requirements.

The generator set can be exercised either in AUT mode with the use of an Automatic Transfer Switch (ATS) or in MAN mode by manual operation of START and STOP and breaker control.

In AUT mode, the exercise period is typically set at the Automatic Transfer Switch (ATS) or switchgear. Exercise begins when the controller receives a remote start signal. The generator set starts automatically and the ATS or switchgear transfers the load from the utility to the generator set to perform the exercise.

Note: Running a loaded exercise without interrupting the utility service requires a load bank.

In MAN mode, perform the exercise in the presence of an operator. If using MAN mode to exercise the generator set, check that the mode is reset for normal operation once the exercise is complete.

During the exercise period apply a minimum of 40% load based on the nameplate standby rating, unless otherwise instructed in the engine operation manual.

The operator should perform all of the prestart checks before starting the manual exercise procedure. Start the generator set according to the starting procedure in Section 4.4, Controller Operation. While the generator set is operating, listen for a smooth-running engine and visually inspect generator set for fluid or exhaust leaks.

The generator set controller does not provide weekly scheduled exercise periods. For scheduled exercise periods, refer to the automatic transfer switch (if equipped) literature.

4.3 Operation in Cold Weather Climates

Cold weather operation is generally considered ambient temperatures below freezing 0°C (32°F). The following items are recommended for cold weather starting and/or operation when the unit is located in an enclosure or unheated structure. Have a licensed electrician install electrical outlets as needed if not already in the immediate area. Check the accessory spec sheets for electrical requirements.

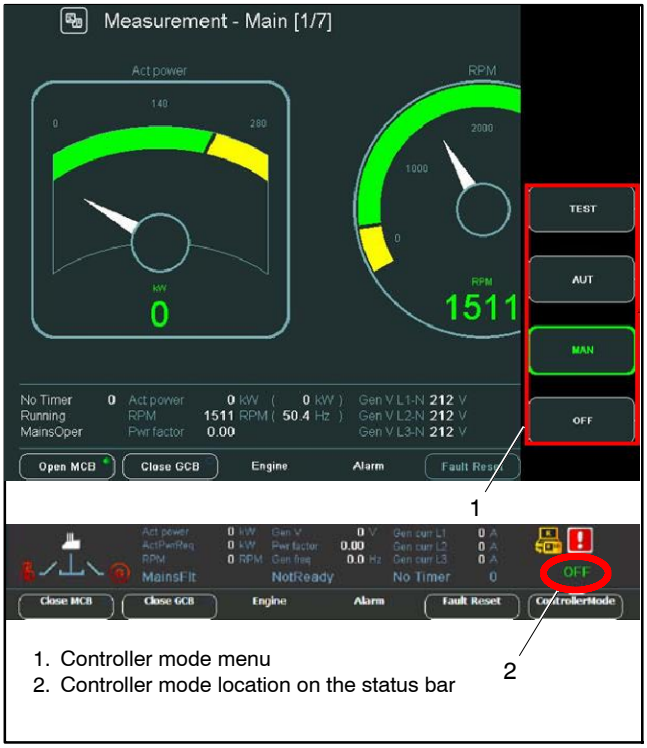
Refer to the engine operation manual regarding engine oil viscosity, fuel composition, and coolant mixture recommendations.

- The **engine block heater** is a standard feature on these units. The Engine block heater improves operation when temperatures are below 30°C (86°F) and is required as part of NFPA 110.
- A **battery heater** is generally recommended for most units when operated below 0°C (32°F). Refer to the respective spec sheet for model availability.
- An **alternator strip heater** provides a heat source to prevent moisture and frost buildup.
- **Heater tape** is recommended for the closed crankcase ventilation system. Wrap the UL/CSA compliant heater tape around the crankcase canister/breather system hose that runs from the crankcase to the air intake and use cable ties as needed to secure the heater tape. If the heater tape is within 152 mm (6 in.) of the exhaust system, use thermal insulation material to protect the heater tape.

4.4 Controller Operation

The operation of the generator set depends primarily on the mode of operation selected. There are three primary modes of operation for the generator set: OFF, MAN, and AUT. To select a mode, press the **Controller Mode** button and select the desired controller mode from the context menu. The status bar displays the controller mode in the bottom right corner. See Figure 4-1.

Note: Some operation buttons do not function in certain modes (example: Start and Stop buttons do not function in AUT mode).



1. Controller mode menu
2. Controller mode location on the status bar

Figure 4-1 Operation Mode Selection

4.4.1 OFF Mode

OFF mode is typically used to disable the controller operation buttons. In OFF mode:

- Start, Stop, and GCB On/Off do not work if pressed.
- The starter, Generator Circuit Breaker (GCB) Close/Open, and fuel solenoid outputs are not energized.

Note: When the generator set is running it is not possible to switch directly to OFF mode. The engine must stop before switching to OFF mode.

4.4.2 MAN Mode (Manual)

MAN mode is typically used to manually operate the generator set. All signals (except protections) are sent to the generator set manually through the operation buttons.

The controller does not respond to external signals and/or conditions. When in manual control, the generator set cannot be stopped automatically (except protections). The generator set is permitted to run unloaded for an unlimited time and must be manually shut down.

Note: Controller does not automatically start the generator set during a power failure or when Remote Start/Stop is closed.

Note: Load control type in mains parallel depends on the following ProcessControl setpoint configuration: #SysLdCtrlPtM = BASELOAD or LDSHARING.

Start button – In MAN mode, pressing the **Start** button begins the Prestart sequences. In the prestart sequence, engine prelube provides lubrication to the engine components.

Prelubrication occurs during **Prestart**. Prelubrication can typically take between 2–5 minutes, depending on the oil temperature.

Open/Close GCB button – Press Open/Close GCB to close the generator circuit breaker (GCB). If the generator set voltage is out of limits (adjusted in the set point group ***Gener protect***), controller does not respond to the Open/Close GCB button. When the generator set voltage is within limits (adjusted in the setpoints group Gener protect) GCB indicator icon on the status bar changes from white to green.

- Controller closes the generator circuit breaker to dead bus.
- Controller starts the generator circuit breaker synchronizing when bus voltage is OK and MCB is closed or when other generator set(s) provide healthy voltage to the bus. Closes the generator circuit breaker when synchronized and stays running in parallel (island or mains parallel).
- Unloads the generator set and opens the generator circuit breaker if the generator set was running parallel to the mains or to other generator set(s).

Stop button – when the generator set is running in MAN mode, pressing the Stop button begins the stop sequence and initiates the cooling state. See the details below for the sequence of events when the Stop button is pressed under different instances.

- If generator set is running in parallel:
  - transfers load to the bus (ramp down)
  - opens the generator circuit breaker
  - goes into cooling state
  - stops the engine
- If generator set is running in single island (or in general there is no mains and no other generator set(s) to transfer the load to):
  - opens the generator circuit breaker (if installed)
  - goes into cooling state
  - stops the engine.
- When engine is running unloaded:
  - activates cooling sequence
  - stops the engine.
- During the cooling state:
  - causes immediate engine stop

Note: To bypass the cooling state and immediately stop the engine, press and hold the Stop button for at least 2 seconds.

4.4.3 AUT Mode (Automatic)

For paralleling operation, refer to Section 5.

In AUT mode, the generator set is waiting for a start signal. The generator set will start and run when a start signal is received via remote start/stop, system start/stop, or power management system. See to the wiring diagram manual or Figure 1-5 for the remote start/stop location.

When the generator set is initially placed in AUT mode, a **Prelubrication** warning will appear. Engine start is disabled while this condition is active. NotReady state is displayed on the controller main screen and the message, ***Prelubrication***, is displayed in the AlarmList.

The initial prelubrication time is between 2–5minutes. Once initial prelube has taken place, prelube will occur for 2 out of every following 20 minutes (2 minutes on and 18 minutes off), keeping the engine ready for immediate start.

Note: Depending on when the generator set is placed into AUT mode during the timing sequence, the initial prelube cycle may be less than 18 minutes.

Note: Controller does not respond to Open/Close GCB, Start, or Stop buttons and corresponding remote InteliMonitor or Modbus commands in AUT mode.

Important: To avoid automatic engine start when using the Fault Reset button after a second level alarm (Shutdown, Slow stop, Breaker Open, and Cooldown), change the following setpoint in the Setpoint context menu under Basic settings: **FltRes GoToMAN = ENABLED**. The engine will attempt to crank as soon as the fault is cleared if the remote start contact is closed, the controller is set to AUT mode, and the FltRes GoToMAN = DISABLED.

4.4.4 Start Signal

A start signal includes the following:

- Remote Start Signal. In AUT mode, an ATS (used during a power outage, exercise period, etc.) or a remote panel provides the start signal. If the remote start contacts are activated, the generator sets in the system that are in AUT mode, will start and run.
- System Start. In MAN mode, Press the **Start** button to send a start signal. This is typically used when exercising the generator set or operating manually.
- System Start. Communications-based start message from a CAN-based remote panel.

Hardwired contacts have priority over all other start signals. If the remote start contacts are activated, the generator sets in the system that are in AUT mode, will start and run. If the generator sets were already running, they will remain running but the original source of that start signal will be ignored. The contacts now have control.

4.4.5 Startup Cranking

During startup, the engine cranks and then rests before starting another cranking cycle. If the maximum number of six crank cycles is exceeded, the controller issues a **Start Fail** alarm. See Figure 4-2 for crank and pause durations. Note the following important setpoints:

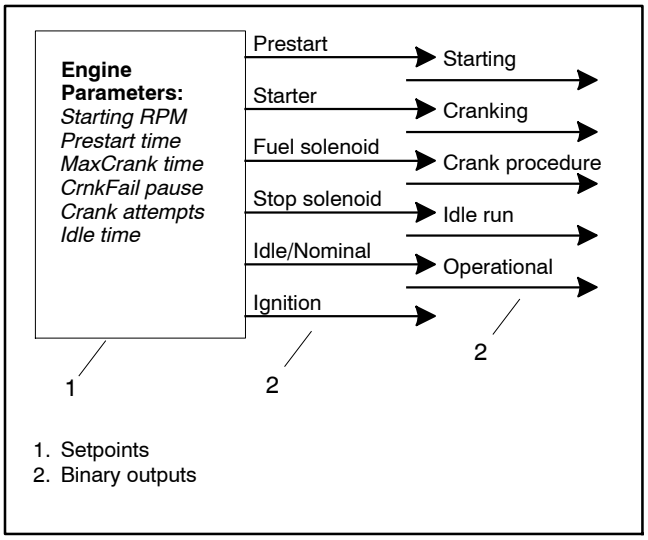
- The force value 5 extends the crank after the third unsuccessful attempt.
- Force value 6 sets pause time after the third unsuccessful attempt.

Cycle	Crank	Pause
1	15 seconds	30 seconds
2	15 seconds	30 seconds
3	15 seconds	30 seconds
4	20 seconds	120 seconds
5	20 seconds	120 seconds
6	20 seconds	Start Fail alarm

Figure 4-2 Decision-Maker® 8000 Specifications

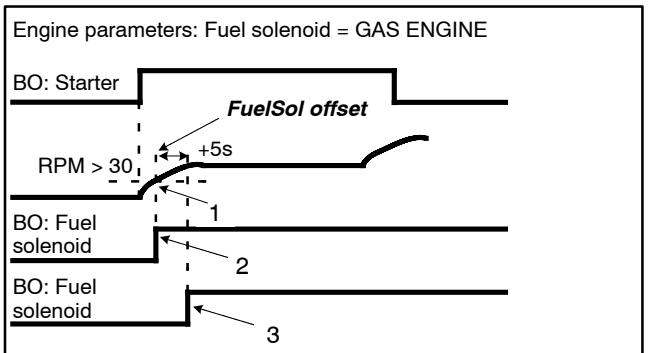
4.4.6 Engine Starting Procedures

The Figure 4-3 through Figure 4-6 show the settings and diagrams for the engine starting procedures. These figures demonstrate how setpoints and binary inputs and outputs are used in the engine starting sequences.



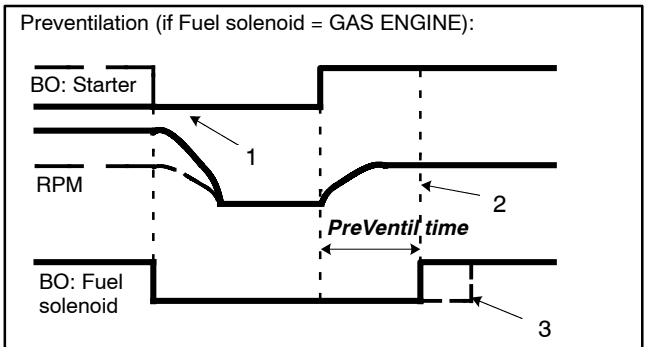
1. Setpoints
2. Binary outputs

Figure 4-3 Engine Starting Settings



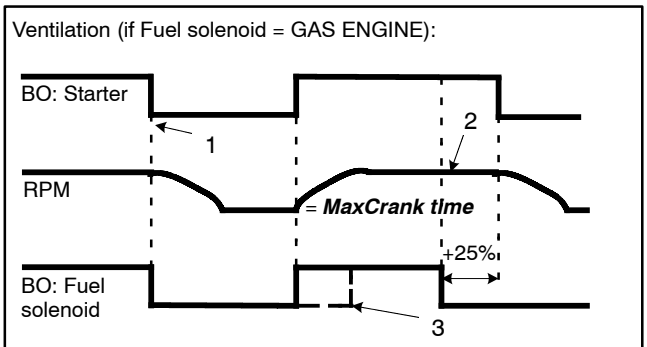
1. ***FuelSol offset*** countdown is started if RPM > 30.
2. 0 s FuelSol offset activates the fuel solenoid immediately if RPM > 30.
3. Max up to 5s fuel solenoid activation

Figure 4-4 Starting Procedure



1. Last unsuccessful start attempt or engine shutdown.
2. Starter activated, but fuel solenoid delayed for ***PreVentil time*** because: last start attempt was not successful or engine shutdown or this is the first start attempt after the controller switch -on.
3. Additional fuel solenoid activation delay can be caused by ***FuelSol offset*** setting.

Figure 4-5 Preventilation Procedure



1. (***CrankAttempts*** – 1) the attempt
2. The last crank attempt is extended by 25% of ***MaxCrank time***, with fuel solenoid closed, to ventilate the gas from the engine.
3. Fuel solenoid activation delay can be set using ***FuelSol offset***.

Figure 4-6 Ventilation Procedure

4.4.7 Stop Signal

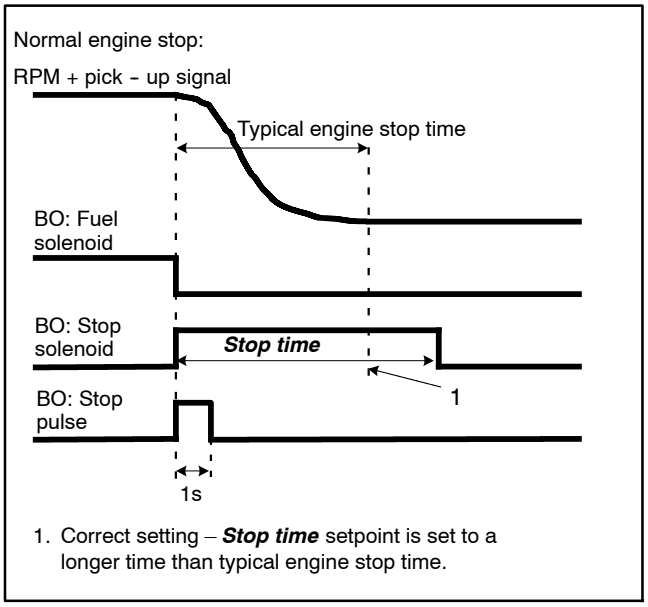
A stop signal includes the following:

- Removal of start signal. In AUT mode, the removal of the start signal from an ATS (used during a power outage, exercise period, etc.) or a remote panel signals the generator set to stop.
- System Stop. In MAN mode, press the **Stop** button to send a stop signal to cancel the system start.

  Note: The **Stop** button does not work in AUT mode.
- System Stop. Communications-based stop message from a remote panel.

4.4.8 Engine Stopping Procedures

Figure 4-7 shows the settings and diagrams for the engine stopping procedures. This figure demonstrates how setpoints and binary outputs are used in the engine starting and stopping sequences.



1. Correct setting – ***Stop time*** setpoint is set to a longer time than typical engine stop time.

Figure 4-7 Stopping Procedure

4.4.9 Stop Time

Stop time is the maximum length of time in which the generator set must completely stop. The stop timer starts when the fuel solenoid is de-energized. If Voltage, Hertz, or RPMs are measured after the Stop Time elapses, the Stop fail alarm is issued.

4.4.10 Cooling

Cooling is a state where the generator set is running at no load to allow hot engine components time to cool slowly before the engine is stopped. In paralleling applications, this occurs with the circuit breaker open. The cooldown cycle lasts for the period of time set by the ***Cooling Time*** setpoint parameter.

When the generator set is running in AUT mode, a cooling cycle begins when the remote start input is deactivated. Also, if stopping due to a system stop signal, a cooldown cycle begins.

When the generator set is running in MAN mode, pressing the **Stop** button begins the cooling cycle.

Note: Repeated pressing or holding the Stop button for more than 2 seconds will cancel the cooling phase of the stop sequence.

Note: During some shutdown faults, no engine cooling cycle occurs. The shutdown is immediate. If possible, run the generator set without load for 30 minutes to ensure adequate engine cooldown.

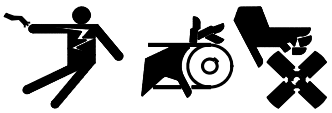
Note: Cooling is bypassed if E-stop is activated.

4.4.11 After Cooling

During aftercooling for 1300REZCK model, a post lubrication of the engine is run after the generator set stops.

4.4.12 Emergency Stop

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

The emergency stop switch is located on the control panel next to the controller display. The operator-activated pushbutton immediately shuts down the engine in emergency situations. See Figure 4-8.

Note: Remote-mounted emergency stop switches can be connected through terminal block 1 (TB1).

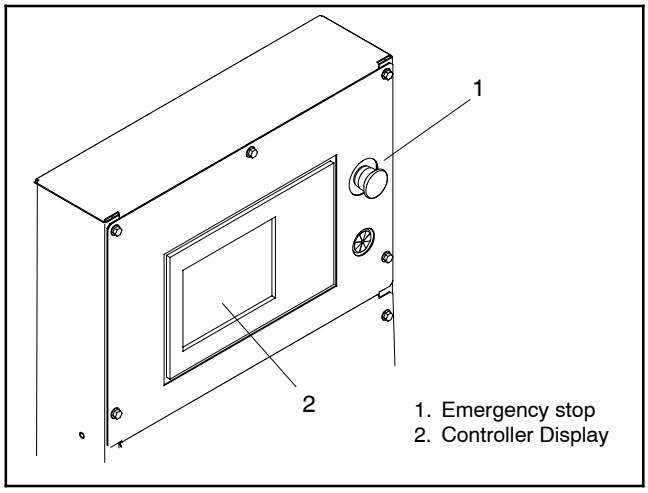


Figure 4-8 Emergency Stop Location

The emergency stop switch bypasses the time delay engine cooldown and immediately shuts down the generator set. The controller Alarm LED light flashes red and the Emergency Stop alarm is displayed on the controller when the local emergency stop switch activates.

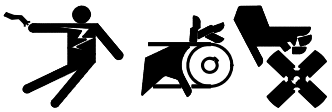
Note: *Use the emergency stop switch for emergency shutdowns only.* For normal shutdowns, place the controller in MAN mode and press the controller **Stop** button (in AUT mode, remove the remote start and/or system start signal).

Use the following procedure to reset the generator set after shutdown by a local or remote emergency stop switch. Refer to Section 4.4.13, Controller Fault Resetting procedure, to restart the generator set following a fault shutdown.

1. Investigate and correct the cause of the emergency stop.
2. Reset the controller emergency stop switch by pulling the switch knob outward.
3. Set to MAN mode to ensure that the generator set does not start once the fault is reset.
4. Press the generator set **Fault Reset** button to clear the alarm list.
5. After resetting all faults, press the generator set **Start** button to restart the generator set. The generator set will not crank until the reset procedure completes.
6. After confirming acceptable operation, return the controller to the desired operation mode.

4.4.13 Controller Resetting (Following System Shutdown or Warning)

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

Use the following procedure to restart the generator set after a system shutdown. This procedure includes the resetting of the optional remote annunciator.

Refer to Section 4.4.12, Emergency Stop, to reset the generator set after an emergency stop.

1. Disconnect the generator set load using the line circuit breaker or automatic transfer switch.
2. Disable the generator set (see above).
3. Correct the cause of the fault shutdown or warning. See the Safety Precautions and Instructions section of this manual before proceeding.
4. Set to MAN mode to ensure that the generator set does not automatically start when the fault is reset.

Note: To avoid automatic engine start when using the Fault Reset button after a second level alarm (Shutdown, Slow stop, Breaker Open, and Cooldown), change the following setpoint in the Setpoint context menu under **Basic settings**: FltRes GoToMAN = ENABLED.

5. Set to MAN mode to ensure that the generator set does not automatically start when the fault is reset.
6. Press the generator set **Fault Reset** button to clear the alarm list.
7. After resetting all faults, press the **Start** button in **MAN mode** to test start the generator set. The generator set will not crank until the prestart cycle completes.
8. Test operate the generator set to verify correction of the shutdown cause.
9. Press the generator set **Stop** button to stop the generator set.
10. Press the **Controller Mode** button and use the context sensitive buttons to select **AUT mode**.
11. Reconnect the generator set load via the line circuit breaker or automatic transfer switch.

4.4.14 System Fault Warning Lamp with Digital Displays

For alarm descriptions, see Appendix C.

A warnings is a level 1 alarm. When a warning is activated, the system Alarm LED light flashes yellow and the alarm horn sounds indicating a warning fault but does not shut down the generator set. See Section 4.4.13, Controller Resetting procedure, for instructions on resetting a system warning. When a warning alarm is detected:

- A new alarm appears on the AlarmList screen.
- The alarm indication LED light flashes yellow.
- The alarm indication icon flashes in the right-hand corner of the status bar.
- A horn sounds.
- A fault is logged in the event history.

Use the Horn Reset button to silence the alarm horn at the operator's discretion.

Note: Not all level 1 alarms, indicated by yellow in the controller, sound a horn or activate an LED indication light.

4.4.15 System Fault Shutdown Lamp with Digital Displays

For alarm descriptions, see Appendix C.

A shutdown is a level 2 alarm. When a shutdown alarm is activated, the alarm LED flashes red, the alarm horn sounds, and the unit shuts down to indicate a fault shutdown. See Section 4.4.13, Controller Resetting procedure, for information on resetting a system shutdown. When a shutdown alarm is detected:

- A new alarm appears on the AlarmList screen.
- The alarm indication LED light flashes red.
- The alarm indication icon flashes in the right-hand corner of the status bar.
- A horn sounds.
- A fault is logged in the event history.
- The controller shuts down the generator set immediately

Use the Horn Reset button to silence the alarm horn at the operator's discretion.

Note: Not all level 2 alarms, indicated by red in the controller, sound a horn or activate an LED indication light.

4.4.16 Load Shedding

Load shedding is typically performed by the ATS or switch gear but can also be performed by the Decision-Maker® 8000. The load shedding function is active in all controller modes except OFF.

Load shedding has three steps and each step is linked with its own Load shed x binary output. See Figure 4-9. There is only one load shed level and delay for all three steps as well as recon level and delay. Load shed can only move from one step to the next. For example, No LoadShed to LdShed S1 to LdShed S2 to LdShed S3 and vice versa. See Figure 4-10.

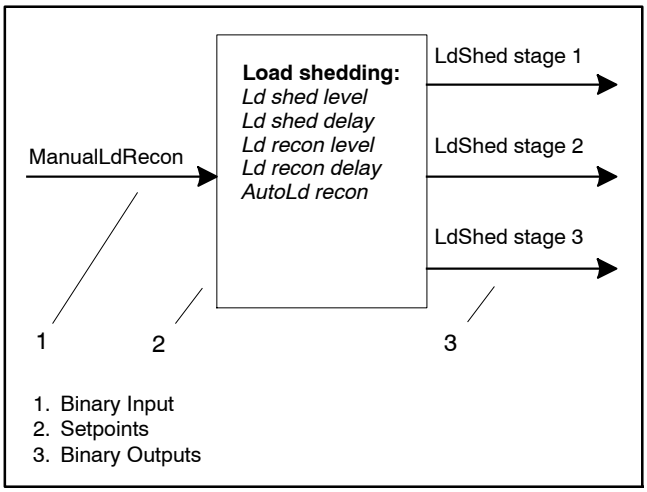


Figure 4-9 Load Shed Settings

See Figure 4-11 for automatic load shedding settings. If manual reconnection of the load is desired, the AutoLd recon setpoint needs to be disabled (**AutoLd recon** = **DISABLED**) and the MAN load recon binary input needs to be configured. See Figure 4-12.

Rising edge on this input resets the controller to a lower stage, but only if the load is under the Ld recon level at that moment.

Note: If no Load Shedding outputs are configured, there is no record to history and no screen timer indication of the activity of this function.

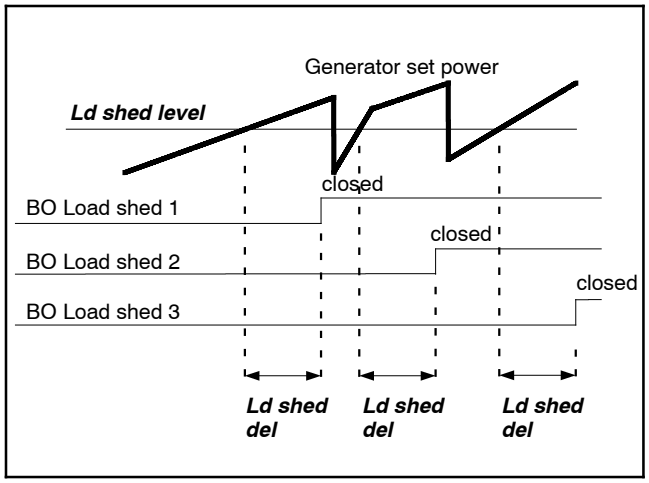


Figure 4-10 Load Shedding

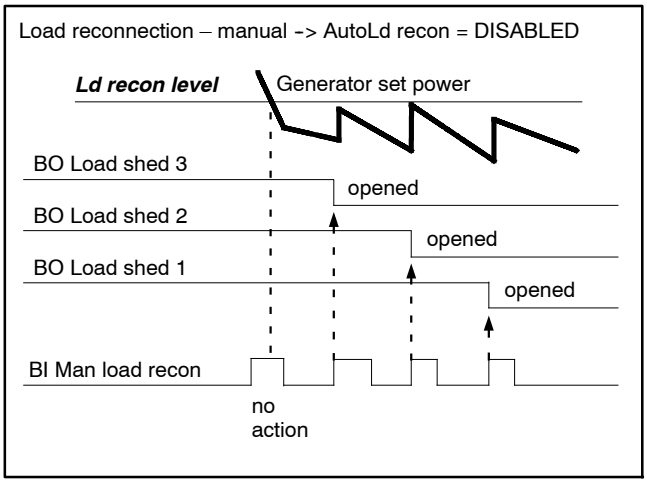


Figure 4-12 Manual Load Reconnect

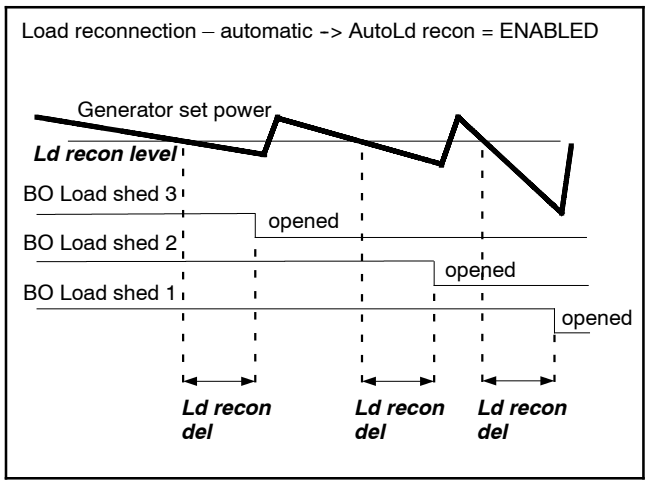


Figure 4-11 Automatic Load Reconnect

4.4.17 Generator Set Operation States

Generator Set State	Description
Init	Controller is powered up and configuration setting is initialized
Not ready	Generator set is not ready to start or is not allowed to start
Ready	Generator set is ready to run, all condition for start are fulfilled
Prestart	Prestart sequence in process. From closing of *Prestart* output to closing of *Starter* output
Cranking	Engine is cranking and the s*tarter* output is closed
Pause	Pause between start attempts is counting down
Starting	Starting RPM is reached
Running	Generator set is running at nominal RPM and waiting for GCB connection
Warming	Generator set is running in parallel operation and gen-set load is reduced to Warming load
Soft load	Generator set power is ramping up
Loaded	Generator set breaker is closed
Soft unld	Generator set power is ramping down
Cooling	State after GCB was opened and engine is not stopped
Stop	Engine is stopped
Shutdown	Shutdown alarm activated
Ventil	Gas engine – ventilation of unburned fuel when stop command comes during cranking with gas
SDVentil	Gas engine – ventilation of unburned fuel after unsuccessful start attempt
Off load	GCB is opened, Generator set keeps running at nominal RPM
Generator Set Conditions	**Description**
IslOper	Island operation (MCB is opened, GCB is closed)
Brks Off	GCB, MCB opened
MainsOper	Mains is present (MCB is closed, GCB is opened)
Synchro	Generator set is synchronizing (MCB is closed, GCB is opened)
ParalOper	Generator set is in parallel with mains (MCB is closed, GCB is closed)
MainsOper/Brk Off	Engine is running idle
MULTSIOP	Multiple island operation (MCB is open; GCB is closed)

Notes

5.1 Controller Operation

Operation buttons work similarly when working in parallel with other generators as when a single generator is in operation. See Section 4.4.

Read and understand the information in this section before attempting to parallel generator sets.

Note: Paralleling operation requires a paralleling option for each generator set in service.

5.1.1 Paralleling Operation in AUT Mode

The following shows the operation sequence of the generator set(s) in AUT mode:

1. All generator sets necessary to cover the selected **LoadRes Strt** setpoint are started when the binary input, **SYS START/STOP**, is activated and the Pwr management setpoint is set to **ENABLED**. Power management can be based on kW, kVA, or on relative % reserve.

2. The first generator set closes the generator circuit breaker (GCB) to the dead bus, the rest are synchronized to the bus.

3. When all necessary generator sets are connected to the bus and **LoadRes Strt** setpoint is achieved, SYST RES OK output is activated.

4. Total load and power factor and/or reactive load are shared between parallel operating generator sets.

5. Activate input LOAD RESERVE 2 (or 3 or 4) and use setpoint **LoadRes strt2** (or 3 or 4) to switch to another load reserve setting.

   a. For example, a high load reserve may be required during system start to switch larger devices on. However, during normal operation, lower load reserve may be needed to save fuel and reduce engine wear.

6. If total load increases and exceeds the selected **LoadRes Strt**, a start delay will occur and the next ready generator set with the highest priority (lowest priority number) is started and synchronized to the bus.

   Note: Use the **Next start del** setpoint to set the start delay time before adding a generator set.

7. If the load decreases and no longer meets the selected **LoadRes Stp**, a stop delay will occur and the running generator set with the lowest priority (highest priority number) is unloaded, taken off line, cooled, and stopped.

   Note: Use the **Next Stop Del** setpoint to set the stop delay time before dropping a generator set.

8. All generator sets in the group will stop when binary input SYS START/STOP is deactivated. When the generator set is unloaded, the output GCB CLOSE/OPEN opens.

   Note: Use setpoints **GCB Open Level** or **GCB Open Del** under the Sync/Load ctrl context menu to set the open level and open delay parameter values.

   Note: Setpoints **GCB Open Level** or **GCB Open Del** are not applicable in standard ATS operation.

9. Running hours balancing or Load demand engines swap can be activated in power management.

5.2 Paralleling Connections

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

This section covers the wiring connections when using Decision-Maker® 8000 in paralleling applications. The customer connection terminal block and dry contact board are located in the lower compartment of the control panel.

1. Remove the generator set from service. Review the precautions at the beginning of Section 5.2 to disable the generator set and to avoid accidental starts.
2. Connect the wires from the position contacts to the designated inputs for breaker position on the customer connection terminal block. See Figure 5-1.
3. Connect the CAN communication wires between the controllers of paralleling generators to the designated connection slots on the customer connection terminal block. See Figure 5-1 and refer to Section 3.10 for detail on CAN bus connections.

   Note: Setpoint **CAN2emptDetect** parameter must be set to **ENABLED** when paralleling multiple generator sets.

   Note: Because the CAN2 communication port on the controller base box connects to the customer connection terminal block (TB1), connect CAN communication wiring to TB1.
4. If using a motorized circuit breaker, connect the close coil and the trip coil to the designated relays on the dry contact board. See Figure 5-2.
5. Refer to the manufacturer instructions for signal and supply connection requirements for particular switch gear components.

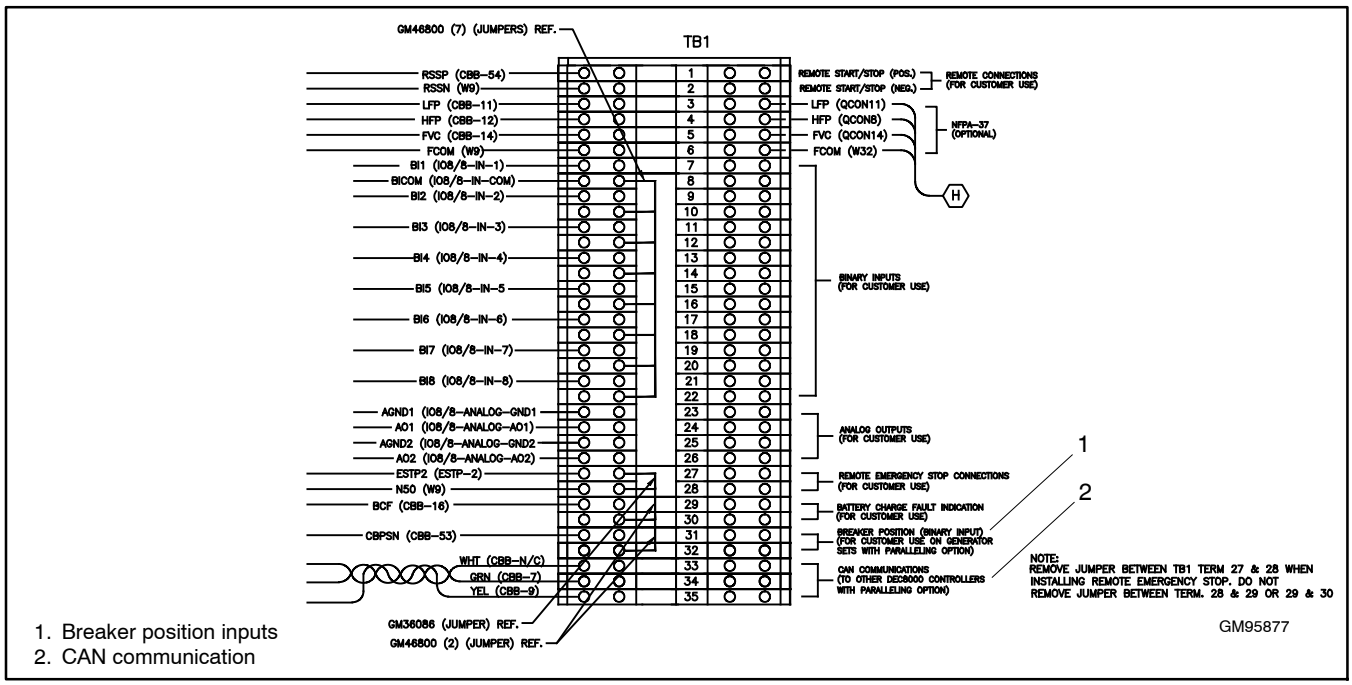
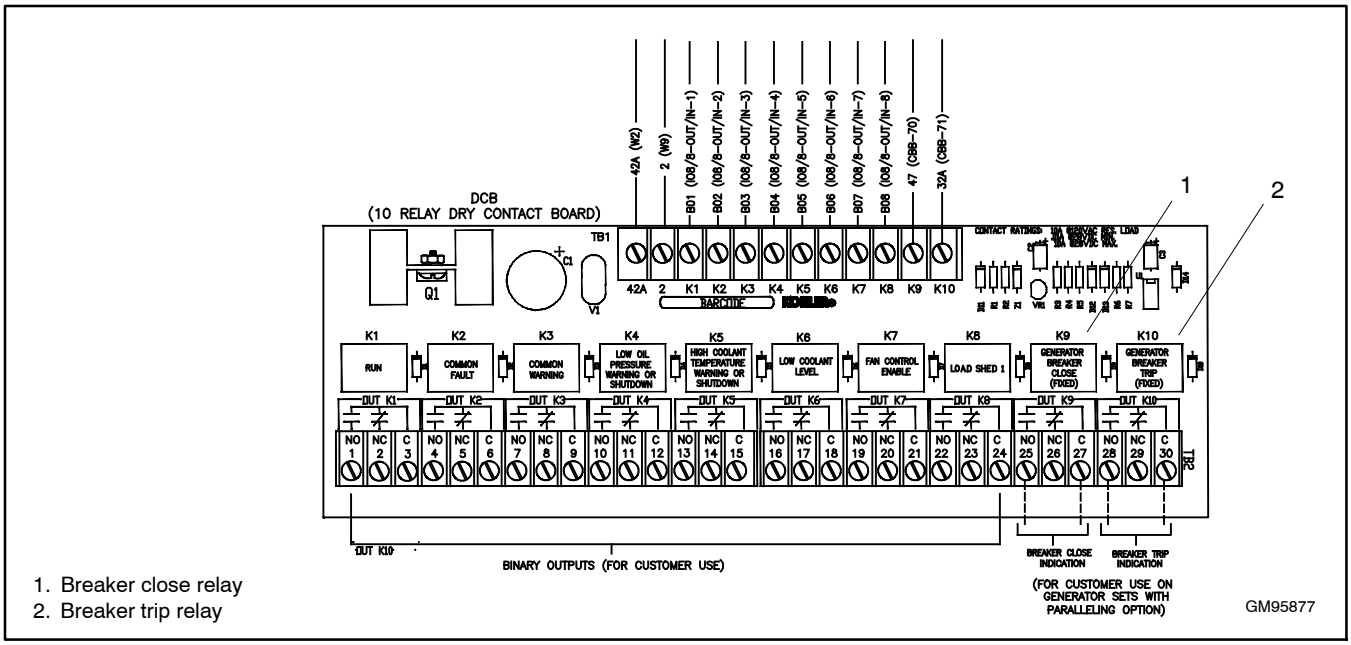


Figure 5-1 Customer Connection Terminal Block (TB1)

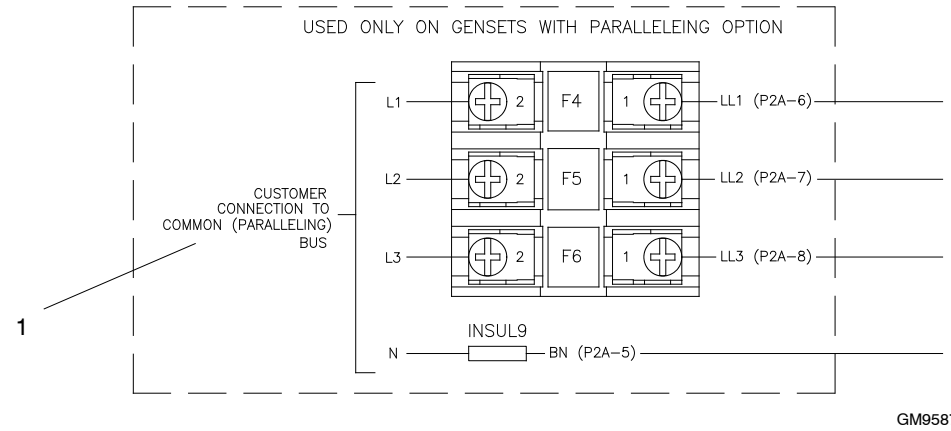


1. Breaker close relay
2. Breaker trip relay

Figure 5-2 Dry Contact Board

6. Connect the bus sensing wires to the fuses in the voltage sensing lines. Connect L1, L2, and L3 to the common (paralleling) bus. See Figure 5-3.

7. To restore the generator set to service, reconnect the generator set engine starting battery(ies), negative (–) lead last.



1. Fuses on the generator set

Figure 5-3 Voltage Sensing Line Fuses

5.3 Active and Reactive Power Control Modes

5.3.1 System Base Load

Generator set group is controlled on constant (or adjustable) power. The Baseload value can be changed by setpoint or via analog input.

Important setpoints under **ProcessControl**:

- #SysLdCtrlPtM = BASELOAD
- #SysBaseload; SysBaseLdMode

5.3.2 Local Baseload

The selected generator set from island or mains parallel running group can be loaded to constant LocalBaseload value. This engine is taken out of Load sharing and Power management. LocalBaseload value is reduced only when the common group (actual) load is lower than this value. The generator sets in the group will try to match their LocalBaseloads (when more than one) based on their controller addresses, so the first limited would be the one with the highest CAN address. For example, this function will switch-off automatically in one or more controllers if there is not enough load to cover all the requested LocalBaseloads.

Important setpoints under **ProcessControl**:

- LocalBaseload

5.3.3 System Base Power Factor

Generator set group is controlled in mains parallel to keep a constant (or adjustable) power factor.

Important setpoints under **ProcessControl**:

- #SysPFCtrlPtM = BASEPF; #SysPwrFactor

5.4 Power Management

Power management is an automatic generator set start/stop function based on load changes and/or Running hours or Engine size. Power management controls the number of generator sets to match the load requirements. Load reserve setpoints determine the load reserve and directs generator sets to be either added to or removed from the load. These load reserve setpoints can be defined either by kW or kVA (absolute power management) or by a percentage of the load (relative power management).

Use the power management mode setpoint (#Pwr mgmt mode) to set load reserve by kw, kVA, or percentage. Use the load reserve setpoints (#LdResStrt, #LdSResStp) and the start and stop delays setpoints (#NextStrt del, #NextStp del) to set the other power management settings. See Figure 4 and Figure 5.

5.4.1 Power Management in kW

With this type of absolute power management, adjustable load reserve (load step) is set in kW and is best suited for load demand-based optimization..

Activation setpoint under **Pwr management**:

- #Pwr mgmt mode = ABS (kW)

5.4.2 Power Management in kVA

With this type of absolute power management, adjustable load reserve (load step) is set in kVA and is best suited for load demand-based optimization.

Activation setpoint under **Pwr management**:

- #Pwr mgmt mode = ABS (kVA)

Note: This mode is intended for systems supplying loads with low power factor. It prevents the gen-sets from operating at high currents.
Note: Load reserve is

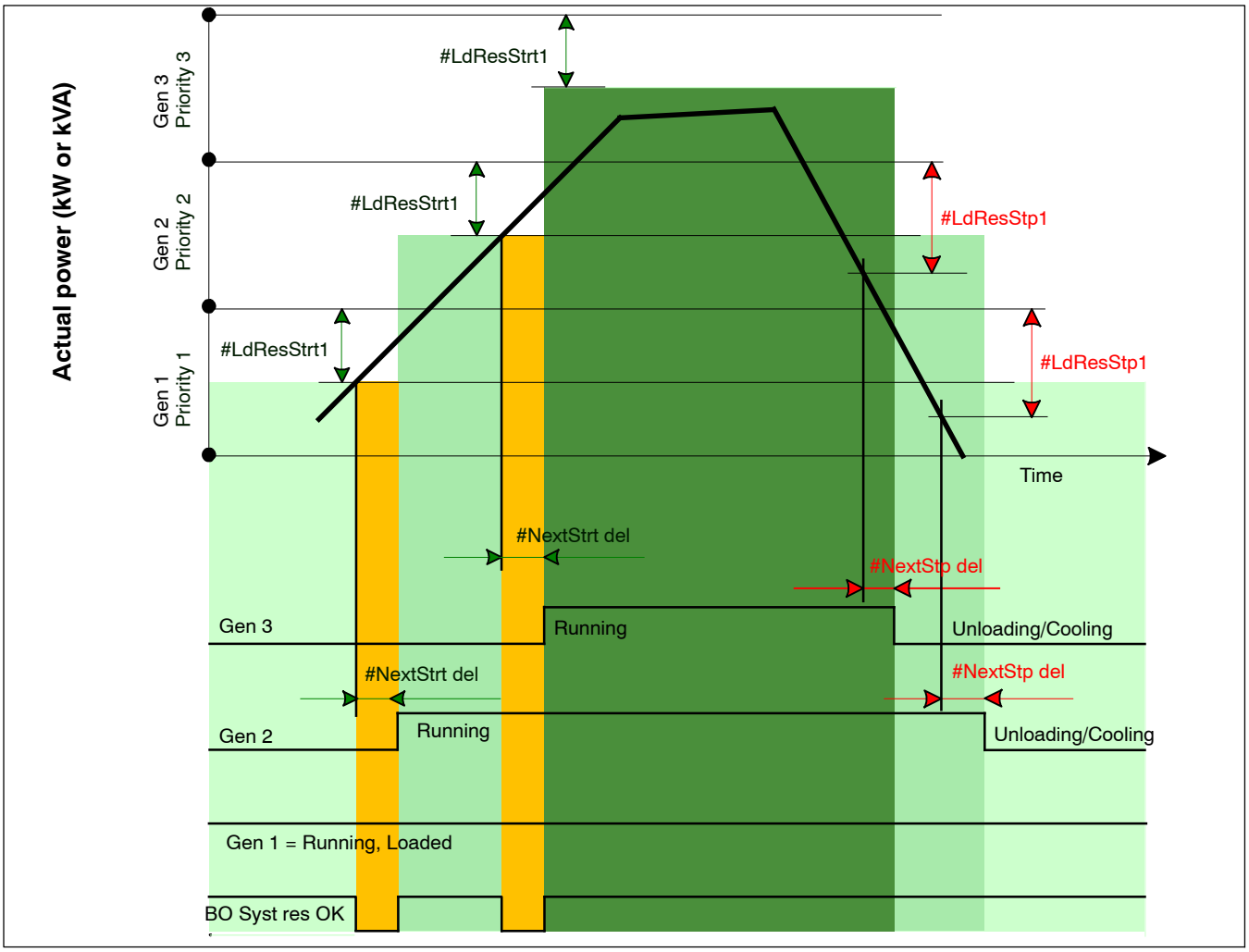


Figure 5-4 Power Management Function in Absolute Mode

5.4.3 Relative Power Management in Percentage

Relative power management is often used when generator sets with different power ratings are paralleled together.

In relative power management, load reserve setpoints (#%LdResStrt1, #%LdResStp1) sets the percentage of the load reserve used to start or stop the next generator set.

Relative power management in percentage guarantees that the engines are not continuously loaded more than to a certain level. This type of power management is typically suitable for engine life-based optimization.

Activation setpoint under **Pwr management**:

- #Pwr mgmt mode = REL (%)

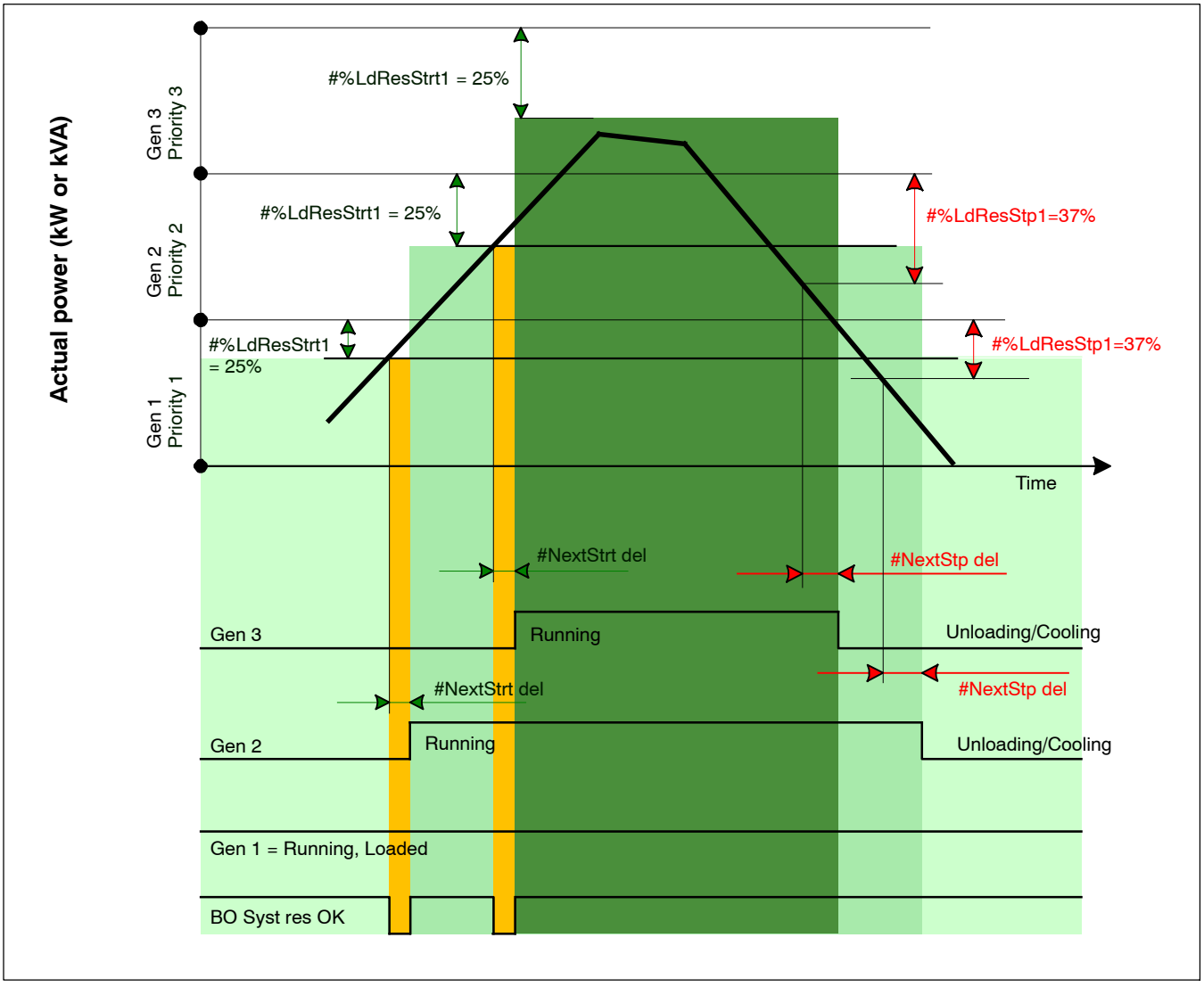


Figure 5-5 Power Management Function in Relative Mode

Reserve	Actual Reserve	Start Condition	Stop condition
Absolute kW / kVA	ARstrt = ΣPgNom – ΣPgAct ARstp = ΣPg*Nom – ΣPgAct	ARstrt < #LdResStrt	ARstp > #LdResStp
Relative %	RRstrt = [(ΣPgNom – ΣPgAct) / ΣPgNom].100% RRstp = [(ΣPg*Nom – ΣPgAct) / ΣPg*Nom].100%	RRstrt < #%LdResStrt	RRstp > #%LdResStp

Figure 5-6 Start/Stop Conditions in Power Management

Where:

- ARstrt — Actual absolute reserve in kW or kVA – for engine start calculation.
- ARstp — Actual absolute reserves in kW or kVA – for engine stop calculation.
- RRstrt — Actual relative reserve in % – for engine start calculation.
- RRstp — Actual relative reserves in % – for engine stop calculation.
- ΣPg_{Nom} — Sum of nominal power of all generator sets on the bus.
- ΣPg^*_{Nom} — Sum of nominal power of all generator sets on the bus apart of the one, which is going to be stopped.
- ΣPg_{Act} — Sum of actual power of all generator sets on the bus = system load.

Note: System starting sequences may be very different due to their complexity (for example, generator sets which do not take part in power management, various nominal powers etc.). Each system should be considered individually. Optional functions in absolute or relative Power management are:
–Running hours balancing (equalization) – in absolute or relative pwr mgmnt
–Load demand (different size) engines swap – in absolute pwr mgmnt only

Note: Nominal power is the rated power or maximum allowed power level of a generator set. Actual power is the amount of power that is actually produced by the generator set.

5.5 Running Hours Equalization (RHE)

The generator sets priorities are automatically swapped to balance engine running hours. Up to 32 controllers are supported.

Activation under Pwr management:

- #PriorAutoSwap = RUN HOURS EQU

Important setpoints:

- RunHoursBase
- #RunHrsMaxDiff
- Priority ctrl
- Control group

EXAMPLE: See Figure 5-7. Generator 1 assumes the role of master in priority swapping and swaps priority of the engines based on their running hours.

- Generator set 1 running hours = 250 -> running hours considered in RHE = 150 (250–RunHoursBase)
- Generator set 2 running hours = 450 -> running hours considered in RHE = 250 (450–RunHoursBase)
- Generator set 3 running hours = 750 -> running hours considered in RHE = 450 (750–RunHoursBase)

All the engines have the same nominal power which is 700 kW. Originally priority of generator sets was G1 = 3, G2 = 2, G3 = 1. Load demand in this example is constant and it is 500 kW (so only one engine is running at any time).

Generator 1 (master) will change priority of generator set 1 to 1 because it has the lowest considered running hours and generator set 1 will run for 210 hours (Second lowest considered running hours – Current lowest considered running hours + #RunHrsMaxDiff 450 – 250 + 10 = 210 hours).

After 210 hours, the situation will change. Generator set 2 will now have the lowest considered running hours (Generator set 1 = 460, Generator set 2 = 450, Generator set 3 = 750). Generator set 2 will now have priority 1 and it will run for 20 hours. Then Generator set 1 will run again for 20 hours.

This will continue until both engines have 770 running hours. Then the third engine will run. At that point, engines priority will swap every 20 hours (2 x Pwr management:#RunHrsMaxDiff).

Note: Core power management is still fully functional. Priority setpoints are not actually changed. Virtual values are used. If changing of priority setpoints is required, they need to be changed and RHE needs to disabled and enabled again for the changes to take place

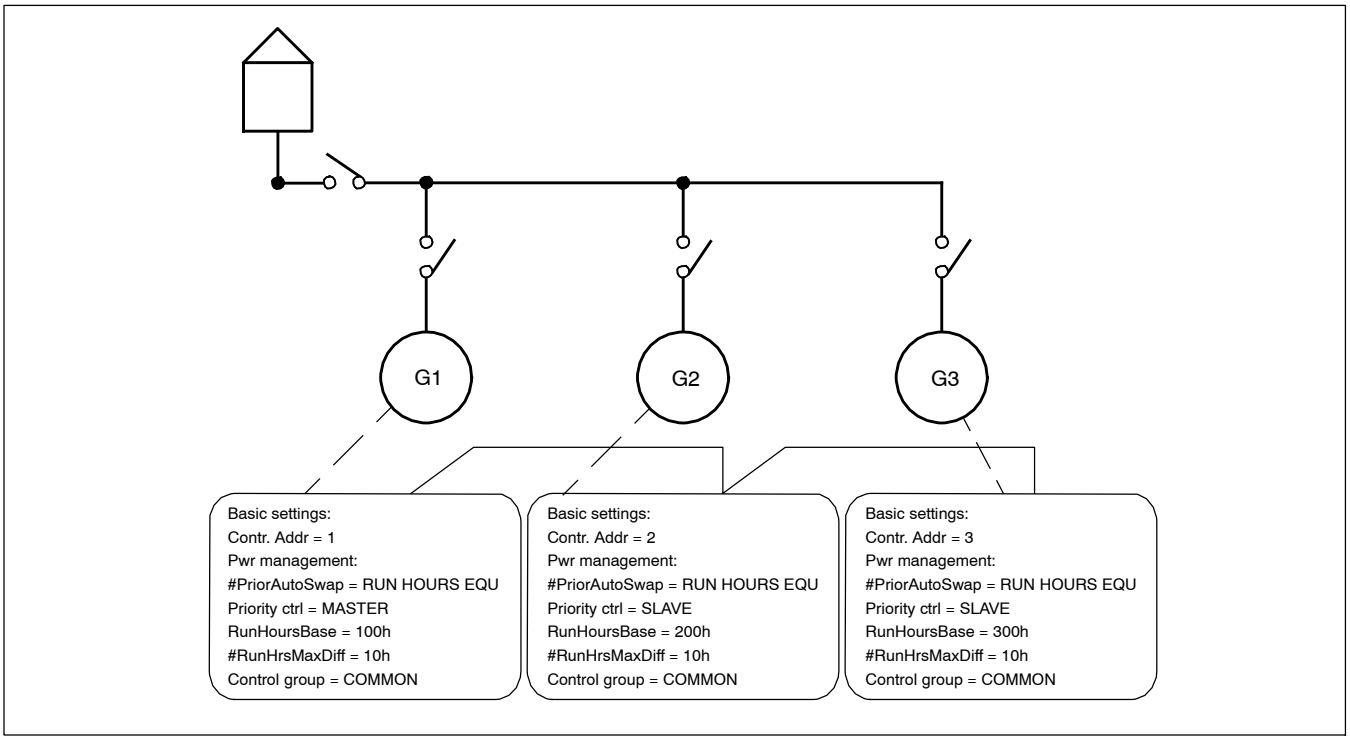


Figure 5-7 Running Hours Equalization Example

5.6 Load Demand Swap (LDS), Different Sized Engines

Up to three running engines (priorities) can be swapped based on load demand (for example, one *small* engine may run on *small* load and swaps to another one, *a big* engine that runs when load increases). This function is available only in combination with absolute power management.

Activation: Pwr management:

- #PriorAutoSwap = LD DEMAND SWAP

Important setpoints:

- #PwrBandContr1
- #PwrBandContr2
- #PwrBandContr3
- #PwrBandContr4
- #PwrBandChngDlUp
- #PwrBandChngDlDn
- Load reserve setpoints (depending on selected load reserve set)
- Priority ctrl
- Control group.

EXAMPLE: See Figure 5-8. Generator 1 assumes the role of master in priority swapping and swaps priority of the engines based on user defined power bands. In power band 1, generator set with CAN address 1 will be running, in power band 2, generator set with CAN address 2 will be running and in power band 3, generator sets with address 2 and 3 will be running. Power bands are changed up if:

- (Nominal power of all generator sets in a particular band – Total generated power by generator sets in power management) < Reserve for start

or down if:

- (Nominal power of all generator sets in next lower band – Total generated power by generator sets in power management) > Reserve for stop

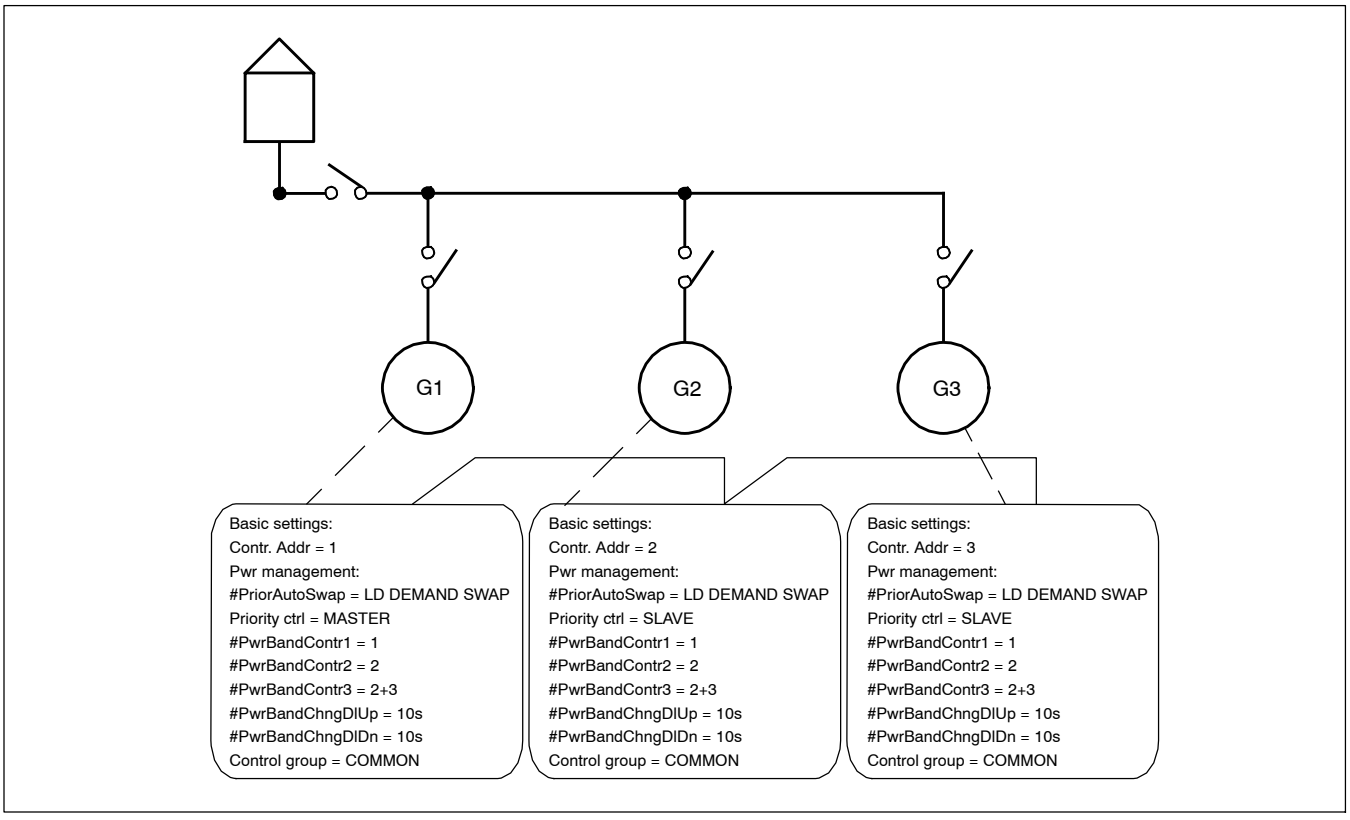


Figure 5-8 Load Demand Swapping Example

5.7 Parallel Commissioning Procedure

Software Requirements:
InteliMonitor
Hardware Requirements:
Null Modem Cable
Direct Serial Port or USB to Serial Adaptor

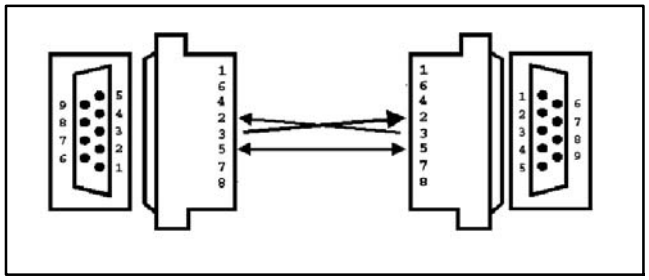


Figure 5-9 Null Modem Cable

Note: The examples shown are for a 2 unit paralleling system. Repeat this process for each generator set added to the parallel group.

5.7.1 Pre-Paralleling Requirements

1. All wiring has been verified and is done in accordance with the wiring diagram, engine operation manual or 3rd party device instructions and documentation.

2. All Decision-Maker® 8000 controllers are communicating on the ***CAN2*** network.

3. The electrical system has been checked and is ready for paralleling:
   Phase Rotation, earth fault, phase – phase shorting, etc...

4. Voltage and Speed control systems have been optimized and tested:
   PID loop adjustment – stable speed and voltage, generator set will pull full load in a standalone condition, etc...

5.7.2 Start up:

1. Ensure all controllers on the CAN2 network are communicating.
   Go to Values>Info
   All controllers active on the CAN2 Network will be shown in Reg16.
   All controllers active in the same Control Group will be shown in CAN16.

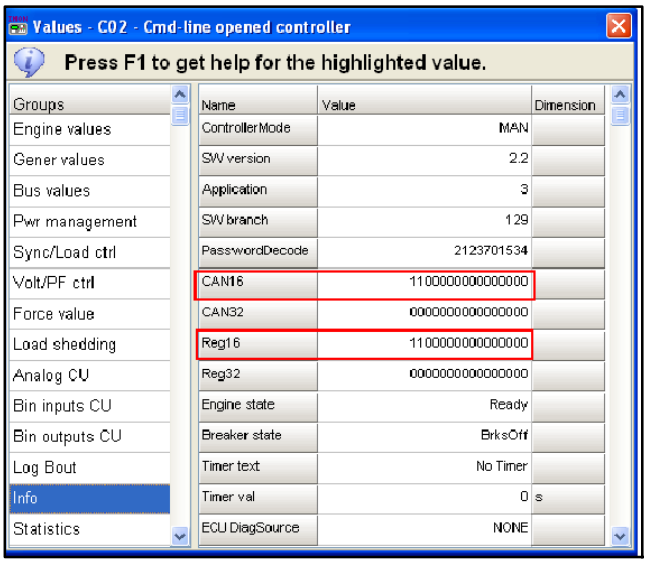


Figure 5-10 CAN Communication Check

2. Speed Control Verification:

   a. Set Phase Window to **0**.

   b. Set Freq gain & Freq int to **0**.

   c. Set the Dwell time. Dwell time is typically set to 0.3 seconds but should be adjusted during commissioning for optimal system behavior.

   d. Set Sync timeout to **1801** = **No Timeout**.

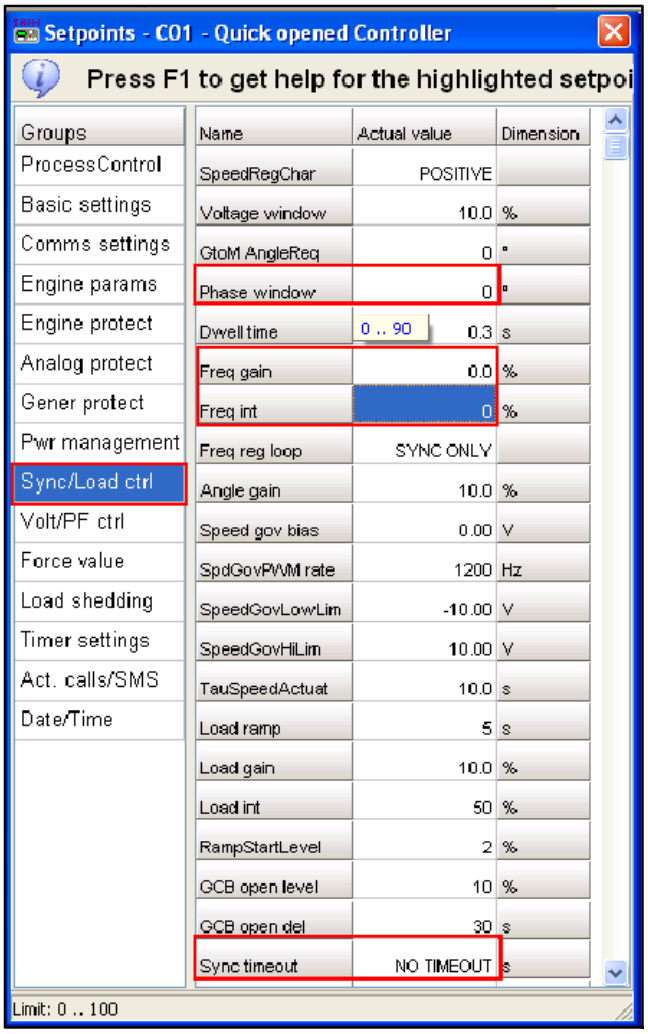


Figure 5-11 Sync/Load Ctrl Settings

e. Start the generator set in **MAN** mode and allow for all timers to expire.

f. Decrease the ***speed gov bias*** setpoint to match ***SpeedGovLowLim*** setpoint.

   Speed should decrease to roughly 5% below nominal RPM.

g. Set ***Speed gov bias*** setpoint to match ***SpeedGovHiLim*** setpoint.

   Speed should increase to roughly 5% above nominal RPM.

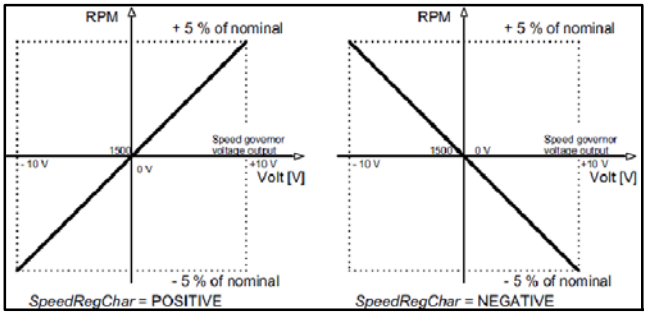


Figure 5-12 Speed Control Test

h. After speed control has been confirmed, ensure the engine will pull full load with speed gov bias wires connected.

   Press the **GCB button** to close the Generator Circuit Breaker (GCB) to a dead bus.

i. Using a load bank, slowly increase load on the generator set to full load and monitor ***SpdRegOut*** voltage to ensure the bias voltage is not at the same voltage as the ***SpeedGovHiLim*** setpoint and that RPM is not decreasing below rated RPM.

   If the bias voltage is maxed out and RPM is decreasing, it will be necessary to adjust the ***Speed Gov/ECU* setpoints and/or increase the setpoint for ***SpeedGovHiLim*** to ensure the engine can pull full load.
   <add picture for Values_Speed/Load Ctrl>

j. Adjust the ***Speed gov bias*** setpoint up or down to get rated RPM/Hz.

3. Voltage Control Verification:

   If **OUT1** and **Out COM** from the AVRi are connected to the AVR for voltage bias signal, the AVR will need to be set to 10% below nominal voltage with the bias signal disconnected to allow the controller to decrease voltage below nominal.

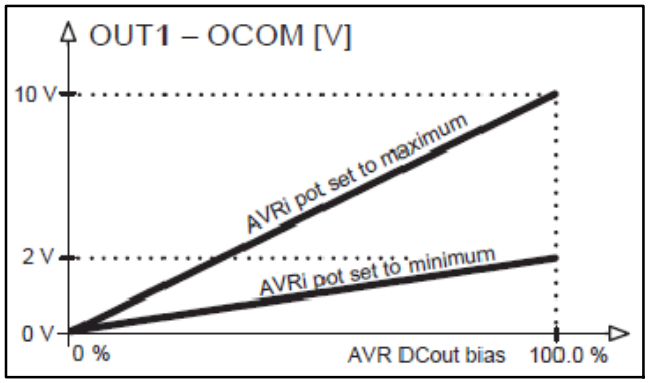


Figure 5-13 AVRi Pot, OUT1–OCOM

If OUT1 and OUT2 from the AVRi are connected to the AVR for voltage bias signal, the AVR should be set to nominal voltage with the bias signal wire disconnected.

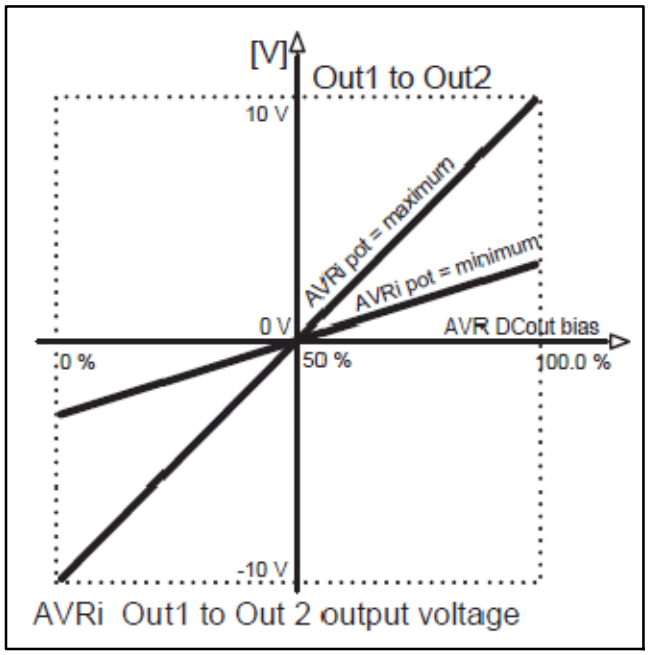


Figure 5-14 AVRi Pot, OUT1–OUT2

a. Set the Voltage window to 10%.
   Set Voltage gain to 0%.
   Set Voltage int to 0%.
   Set DC Out bias to 50%.
   Set the trim pot on the AVRi to minimum setting counterclockwise.

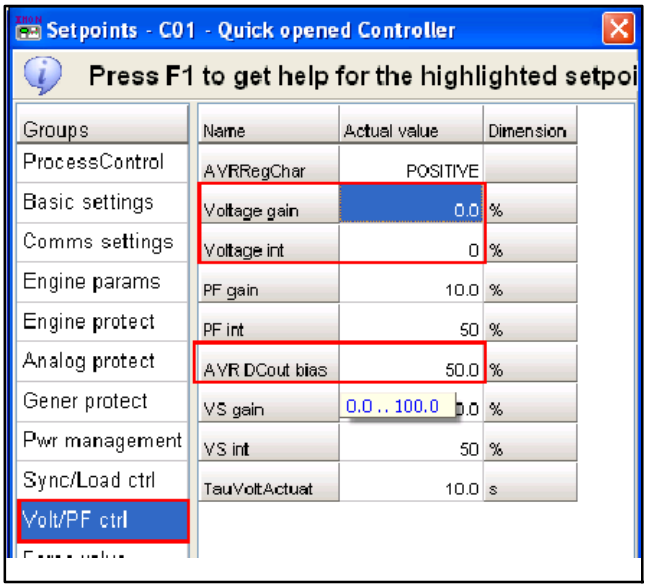


Figure 5-15 Volt/PF Ctrl Settings

b. With the engine running, note the system voltage. Decrease the AVR DC Out bias to 0% and generator voltage should decrease by 10% of nominal.

   If system voltage decreases but not sufficiently and OUT1 & OUT COM are being used, the adjustment will need to be done on the AVR. If OUT1 & OUT2 are being used, increase the trim pot clockwise until desired voltage is reached.

c. Set DC Out bias to 100%. System voltage should increase to 10% above nominal voltage. If system voltage increases but not sufficiently, increase the trim pot on the AVRi clockwise until desired voltage is reached.

d. Adjust the DC Out bias up or down to achieve nominal voltage. DC Out bias should be close to 50% for optimal performance.

e. Set the Voltage gain to 10% — start increasing voltage gain in increments of 10% until voltage becomes unstable. Once voltage is unstable, note the Voltage gain and decrease the setpoint by 30%.

f. Set the Voltage int to 100%, then change the DC out bias setpoint by 10% to check the PID loop and AVR response.

   If voltage performance is correct, set DC out bias back to the setpoint that achieved nominal voltage.

4. Synchronizing Speed Set up:

   a. Start generator set “B” in the manual mode and, once all timers have expired, press the GCB button closing the generator set to the dead bus.

      Start generator set “A” (that is currently being set up) in the manual mode. Once all timers have expired, press the GCB button putting generator set *A* into *Synchro* mode.

   b. Increase the Freq gain in increments of 5% until speed becomes unstable and the engine starts hunting. Note the Freq gain setpoint and decrease by 30%. If instability is reached before 30%, divide the value by 2.

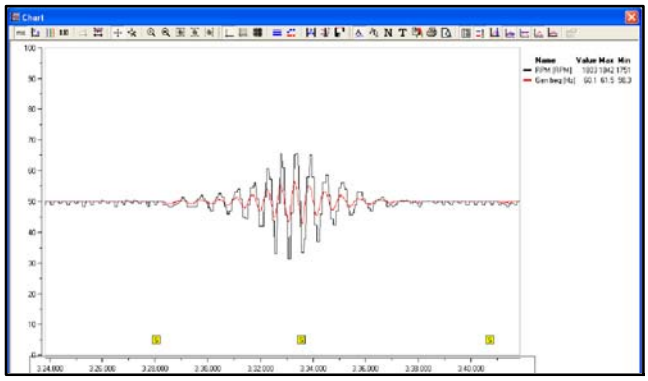


Figure 5-16 Speed and Frequency Chart

   c. Press the GCB button taking the controller out of Synchro mode.

      On the display, go to the parallel metering screen to view the Sync scope. See Figure 5-17.

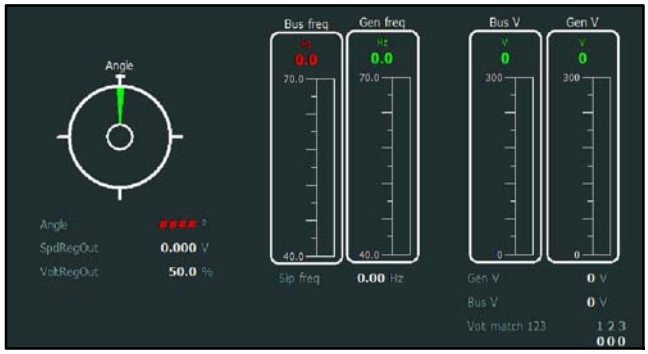


Figure 5-17 Parallel Screen

      Set the Freq int to 10% and press the GCB button putting the controller back into Synchro Mode.

      Watch the needle on the Sync Scope and the needle should move smoothly and quickly up to 12 o’clock. If the response is too slow, continue to repeat this process while increasing the Voltage int setpoint until smooth quick slip control is achieved.

   d. Verify the Angle gain is set to 5% and start to increase the Angle Gain in increments of 5% until the needle on the Sync Scope becomes unstable and decrease the value by 30%.

5. Repeat this entire process to generator set “B” – Steps 1 through 4.d.

6. Once both generator sets have been optimized, change the Phase window setpoint to the desired value and parallel both generators together.

   a. Set the LS int to 100% on both generator sets.

      Set the LS gain to 10% on both generator sets.

   b. Using a resistive load bank, place between 30% and 40% combined load on both generator sets.

      For example, 60–80 kW total load for 2, 100 kW generator sets

   c. Ensure load is being shared evenly between the 2 generator sets.

      Press the GCB button on generator set “A” to remove it from the electrical bus.

      Press the GCB button on generator set “A” to parallel it to generator set “B.”

      Observe load on both generator sets and increase/decrease the LS gain on each generator set while repeating this process until desired performance is achieved.

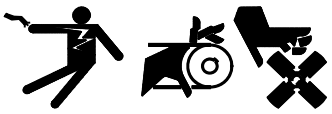
7. Repeat this process using a reactive load bank while adjusting the VS gain and VS into ensure proper VAr sharing between generator sets.

Notes

Under normal operating conditions, the generator set's alternator requires no routine service. Consult Section 1.3, Prestart Checklist, for a list of routine checks.

IMPORTANT: All engine maintenance, other than daily maintenance, must be performed by a certified Kohler technician.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

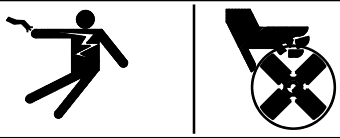
⚠ WARNING

Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

⚠ DANGER



Hazardous voltage. Moving parts.
Will cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

Servicing the generator set when it is operating. Exposed moving parts will cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

⚠ WARNING

Risk of fire.
Can cause severe injury or death.

Do not smoke or permit flames or sparks near fuels or the fuel system.

Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner removed.

Servicing the fuel system. A flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the fuel mixer, fuel line, fuel filter, or other potential sources of fuel vapors. When removing the fuel line or fuel system be aware that liquid propane can cause frostbite on contact.

The fuel system. Explosive fuel vapors can cause severe injury or death. Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks. Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid fuel line breakage caused by vibration. Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.

Allow the engine to cool. Release pressure from the cooling system before removing the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise to the first stop. Remove the cap after pressure has been completely released and the engine has cooled. Check the coolant level at the tank if the generator set has a coolant recovery tank.

6.1 Service Timers and Alarms

Four service timers count down to initiate a WrnServiceTime alarm. These timers serve as reminders for scheduled maintenance such as oil or spark plug change.

The four available timers provide a high level of customization for alerts related to particular service requirements. Using the service schedules in Section 6.4 and the engine operation manual as guides, change the engine protections setpoints, Service time 1–4, as desired to initiate scheduled maintenance reminders. Once expired, a timer can be reset to begin a new countdown.

- A service timer will count down from the initial or present value, while the engine is running. When the service timer value reaches 0 (zero), a warning will occur. This warning will persist until the service timer value is reset.
- Once a respective service is performed, reset the service timer to the appropriate values. Service timers can be reset before they expire.
- To disable a service timer, set the timer value to 65535.

See Appendix B for more information about Service time 1–4 setpoints and Appendix C for WrnServiceTime alarm.

6.2 Alternator Service

⚠ CAUTION

Hot surfaces.

Servicing the alternator. Hot parts can cause severe injury or death. Avoid touching the alternator field or exciter armature. When shorted, the alternator field and exciter armature become hot enough to cause severe burns.

When operating the generator set under dusty or dirty conditions, use dry compressed air to blow dust out of the alternator while the generator set is running. Direct the stream of air through openings in the generator set end bracket.

6.3 Engine Service

Have an certified Kohler technician perform engine service at the intervals specified in the engine operation and maintenance manual.

Note: Have maintenance work, including battery service, performed by appropriately skilled and suitably trained maintenance personnel familiar with generator set operation and service.

6.4 Service Schedule

System—Component	Action					Interval
	Visually Inspect	Check	Change	Clean	Test	
Fuel System						
Flexible lines and connections	X		R			Weekly
Solenoid valve operation	X				X	Weekly
Filter(s)			●			Quarterly
Fuel piping	X					Yearly
Fuel valve		X			X	Yearly
High and low fuel pressure switches		X			X	Yearly
Proof-of-closure switch		X			X	Yearly
Lubrication System						
Refer to the engine operation and maintenance manual for engine maintenance schedules and information. **IMPORTANT:** All engine maintenance, other than daily maintenance, must be performed by a certified Kohler technician.						
Cooling System						
Air cleaner to room/enclosure		X				Weekly
Block heater operation		X				Weekly
Coolant level	●	●				Weekly
Flexible hoses and connectors	X	X				Weekly
Water pump(s)	●					Weekly
Fan belts	●	●	R			Monthly
Coolant temperature protection level					●	Six Months
Air ducts, louvers		X		X		Yearly
Coolant			●			Yearly
Heat exchanger				X		Yearly
Louver motors and controls	X			X	X	Yearly
Radiator exterior				X		Yearly
Water supply to heat exchanger		X				Yearly
Exhaust System						
Drain condensate trap		X				Weekly
Leakage	X	X				Weekly
Insulation, fire hazards	X					Quarterly
Flexible connector(s)	X					Six Months
Excessive back pressure					X	Yearly
Hangers and supports	X					Yearly
DC Electrical System						
Battery charger operation, charge rate	X					Monthly
Battery electrolyte level		X				Monthly
Battery specific gravity, charge state					X	Monthly
Recharge after engine start		X				Monthly
Remove corrosion, clean and dry battery and rack	X			X		Monthly
Clean and tighten battery terminals	X	X				Quarterly
Tighten DC electrical connections		X				Six Months

● Follow procedures and frequencies indicated in the engine manufacturer's maintenance manual. If not indicated, follow this service schedule. Some items may not apply to all generator sets.
R Replace as necessary.
X Action
* Service more frequently if operated in dusty areas.

Service Schedule, continued

System—Component	Action					Interval
	Visually Inspect	Check	Change	Clean	Test	
AC Electrical System						
General Inspection	X					Weekly
Circuit breakers, fuses†	X	X	R	X	X	Monthly
Wire abrasions where subject to motion	X	X				Quarterly
Safety and alarm operation		X			X	Six Months
Tighten control and power wiring connections		X				Yearly
Transfer switch main contacts†	X			X		Yearly
Voltage-sensing device/relay adjustment†		●			●	Yearly
Wire-cable insulation breakdown	X				X	3 Years or 500 Hrs.
Engine and Mounting						
Refer to the engine operation and maintenance manual for engine maintenance schedules and information. **IMPORTANT:** All engine maintenance, other than daily maintenance, must be performed by an certified Kohler technician.						
Remote Control System, etc.						
Compartment condition	X			X		Weekly
Remote control					X	Monthly
Run generator set					X	Monthly
Alternator						
General inspection	X					Weekly
Rotor and stator	X			X		Yearly
Bearing condition	X	X	R			Yearly
Exciter	X	X		X		Yearly
Voltage regulator	X	X		X		Yearly
Measure and record resistance readings of windings with insulation tester (Megger®, with SCR assembly or rectifier disconnected)					X	Yearly
Blow dust out of alternator*	X			●		2 Years or 300 Hrs.
Decision-Maker® 8000						
Controller RTC battery			X			10 years
General Condition of Equipment						
Any condition of vibration, leakage, noise, temperature, or deterioration	X	X		X		Weekly
Ensure that controller is set to the desired mode: AUT, Man, Off	X					Weekly
Interior of equipment room or outdoor weather housing	X			X		Weekly

● Follow procedures and frequencies indicated in the engine manufacturer's maintenance manual. If not indicated, follow this service schedule. Some items may not apply to all generator sets.
R Replace as necessary.
X Action.
* Service more frequently if operated in dusty areas.
† Do not break manufacturer's seals or internally inspect these devices.

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6.5 Natural Gas Fuel System

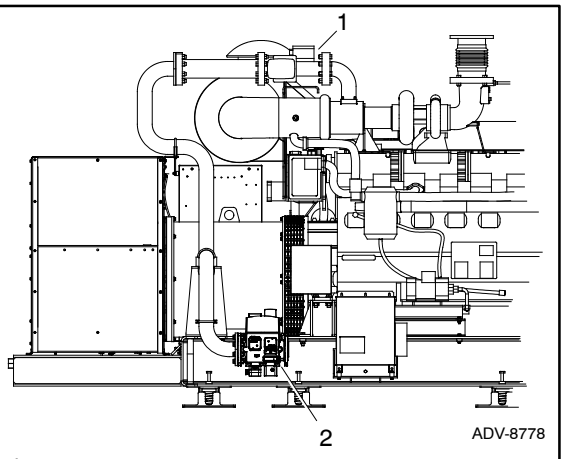
This section describes natural gas fuel system components that are not covered in the engine operation manual.

6.5.1 Gas Fuel System Concept (Single Fuel)

The gas fuel system uses a dual-solenoid fuel valve to control the fuel flow to the fuel metering valve (EPR). The generator set-mounted fuel metering valve reduces the fuel pressure as fuel passes to the fuel mixer. See Figure 6-1.

The fuel mixer controls the ratio of fuel to air under varying load and speed conditions. Because the fuel mixer receives fuel in a gaseous state, it does not have to vaporize the fuel.

Refer to the generator set service manual for procedures on testing and replacing the fuel valve.



1. Fuel meter
2. Fuel solenoid

Figure 6-1 Fuel Metering Valve and Dual-Solenoid Fuel Valve, Typical

6.5.2 Crankcase Ventilation (CCV) Heater Kit

The crankcase ventilation (CCV) heater kit provides a controlled heating source to the crankcase ventilation system preventing freezing water buildup during cold weather. The thermostat maintains 15°C (60°F).

6.6 Alternator Bearing Service

Have an authorized service distributor/dealer perform service.

6.6.1 5M/7M Single-Bearing Alternator

The alternator bearing requires lubrication at intervals specified in the generator set technical manual. Use Chevron SRI or equivalent antifriction, high-quality grease with a lubrication temperature range of –30°C to 175°C (–22°F to 350°F).

6.6.2 7M Dual-Bearing Alternator

The 7M dual bearing alternator is a close coupled style and does not require the alignment procedure stated in the alternator service manual, Section 3.4, Dual Bearing Alternator Installation and Alignment.

Refer to the alternator service manual for bearing maintenance information.

6.7 Cooling System

The cooling system requires a remote radiator. The following cooling system maintenance information applies to the radiator kits in Figure 6-2. For other remote radiators, refer to the radiator manufacturer's instructions.

Refer to the radiator specification sheet and installation instructions for specific information pertaining to the remote radiator.

Remote Radiator Kit	Generator Set Model	Motor Starter Kit	Voltage
GM100760-KP1	400REZCK	GM100767-KP1	230/460
GM99318-KP1	500REZK	GM99164-KP1	230/460
GM100761-KP1	600REZCK	GM100768-KP1	230/460
GM99319-KP1	750REZK	GM99295-KP1	230/460
GM100762-KP1	800REZCK	GM100769-KP1	230/460
GM94906-KP1	1000REZK	GM98861-KP1	230/460
GM100763-KP1	1000REZCK	GM100769-KP1	230/460
GM100763-KP1	1000REZCK	GM100769-KP1	230/460
GM98851-KP1	1300REZCK	GM-99295KP1	230/460

Figure 6-2 Remote Radiator Kits

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.

Allow the engine to cool. Release pressure from the cooling system before removing the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise to the first stop. Remove the cap after pressure has been completely released and the engine has cooled. Check the coolant level at the tank if the generator set has a coolant recovery tank.

Note: Engine damage. Bleed the air from the cooling system to prevent overheating and subsequent engine damage.

Note: Block heater damage. The block heater will fail if the energized heater element is not immersed in coolant. Fill the cooling system before turning on the block heater. Run the engine until it is warm, and refill the radiator to purge the air from the system before energizing the block heater.

6.7.1 Coolant Level Check

Check the coolant level in the coolant recovery tank. Maintain the coolant level between the high and low marks.

Note: Periodically check the radiator sight glass to determine the coolant level. Do not rely solely on the level in the SEDD tank. Add fresh coolant until the level is just below the overflow tube opening of the filler neck.

6.7.2 Cooling System Component Inspection

To prevent generator set shutdown or damage caused by overheating:

- Keep the cooling air inlets clean and unobstructed.
- Inspect the radiator's exterior for obstructions. Remove dirt and foreign material using a soft brush or cloth to avoid damaging the radiator fins.
- Check the hoses and connections for leaks. Replace any cracked, frayed, or spongy hoses.
- Check the condition and tension of the radiator fan. Follow the belt tension procedure in this manual and/or the engine operation manual.
- Check the pressure cap seal and replace a cracked or deteriorated cap. Remove dirt and other debris from the pressure cap and filler neck. The pressure cap raises the boiling point of the coolant, enabling higher operating temperatures. Replace a leaking pressure cap with one rated for the same pressure. The pressure cap rating usually appears on the pressure cap.

6.7.3 Procedure to Drain Cooling System

For optimum protection, drain, flush, and refill the cooling system at the intervals listed in the service schedule.

Note: Dispose of all waste materials (oil, fuel, coolant, filters, and gaskets) in an environmentally safe manner.

1. Deenergize the block heater.
2. Remove the pressure cap to allow the entire system to drain and prevent air pockets from restricting coolant flow through the engine block.
3. Open the radiator and/or engine block coolant drain valve(s) and allow the system to drain.
4. If the inside of the radiator has mineral deposits or the used coolant contains dirt or grease, refer to Section 6.7.4, Procedure to Flush and Clean the Cooling System. If the cooling system does not have mineral deposits, go to Section 6.7.5, Procedure to Refill the Cooling System.

6.7.4 Procedure to Flush and Clean Cooling System

Use the instructions in the engine operation and maintenance manual when available to flush and clean the cooling system. Otherwise, use the following procedure and the cooling system cleaner manufacturer's instructions.

1. Flush the cooling system with clean water.
2. If the inside of the radiator still has mineral deposits, use a radiator cleaner to remove the remaining deposits following the manufacturer's instructions.
3. Drain, clean, and flush the coolant recovery tank.

6.7.5 Procedure to Refill Cooling System

See the generator set spec sheet for coolant capacity and see the engine operation and maintenance manual for additional cooling system refilling information.

Note: Do not add coolant to a hot engine. Adding coolant to a hot engine can cause the cylinder block or cylinder head to crack. Wait until the engine has cooled.

1. Remove the pressure cap.
2. Close the radiator and/or engine block coolant drain valve(s) and tighten the cooling system hose clamps.
3. Open the air-bleed petcocks, if equipped. Close the air-bleed petcocks when coolant begins to flow from them.
4. Add coolant additives or water pump lubricants according to the engine manufacturer's recommendations in the engine operation and maintenance manual.
5. Fill the cooling system with the recommended coolant/antifreeze mixture to inhibit rust/corrosion and prevent freezing.

Note: A mixture of 30% ethylene glycol is standard; however, a mixture up to 50% is allowable depending upon ambient temperature conditions.

6. Replace the pressure cap.
7. Fill the coolant recovery tank to the low mark.
8. Operate generator set until the thermostat opens when the upper cooling system hose warms.
9. Stop the engine and allow it to cool.
10. Check and repair any coolant leaks.
11. Remove the pressure cap.
12. Add coolant to bring the coolant level to just below the overflow tube opening of the filler neck.
13. Replace the pressure cap.
14. Maintain the coolant level in the coolant recovery tank between the high and low marks.

    Air pockets often form in the engine water jacket when the coolant system is refilled. Check the coolant level in the coolant recovery tank after each generator set operation and add coolant as necessary until the coolant level stabilizes. Then check the coolant at the interval specified in the service schedule.
15. Reenergize the block heater.

6.7.6 Radiator Maintenance

Use the following list for radiator maintenance:

- Periodically check for leakage from the core or tank connections.
- Inspect the liquid level at regular intervals using the top tank sight glass.
- Test antifreeze before cold weather periods.
- If the unit is on stand-by for long periods of time, check the interior of the top tank through the fill neck for signs of scale or rust every one to three months. If necessary, the radiator should be cleaned, flushed, and treated.
- Dirt and debris can be removed from the core face with compressed air, steam, or water, if required. If water is used, slowly increase the pressure and stand at least .9 m (3 feet) away from the core. Keep the water stream parallel with the fins in order to avoid damaging them.

Note: Ensure that fins and tubes are not damaged from rough brushing or excessive jet pressure of the steam, air, or water.

- Clean fan blades once per year. Use a stiff brush or an air nozzle for loose dirt and a nonflammable solvent with brush for solid deposits. Care must be taken not to damage the fan blades as a resulting out-of-balance condition might cause vibration and damage to fan bearings or motor bearings.
- Inspect motor at regular intervals. Keep the motor clean and ventilation openings clear. To clean motors, use a soft brush and, if necessary, a slow acting solvent in a well-ventilated room.
- Re-lubricate motors with GE grease D6A2C14 or any Polyurea thickened grease according to the intervals listed in the chart below. The motor will most likely be a Totally Enclosed Fan Cooled (TEFC) Motor.
  - To re-lubricate these motors, remove the caps on the fan cover for access to the grease plugs.
  - On the drive end and opposite drive end of motors with pipe plugs, insert a lubrication fitting. Remove the other plug for grease relief of all motors.
  - Clean grease relief opening of any hardened grease. Be sure fittings are clean and free of dirt. Insert a pipe cleaner down the relief hole.
  - Using a low-pressure, hand-operated grease gun, pump in clean recommended grease until new grease appears on the pipe cleaner.
  - After lubricating, allow the motor to run for 10 minutes before replacing the relief plug.

Application	Horse Power Range	Lubrication Interval Vertical
Normal	1.0 – 7.5	1.5 years
	10 – 40	6 months
	50 – 150	3 months
High - Ambient and/or Dirty Environment	1.0 – 7.5	6 months
	10 – 40	3 months
	50 – 150	2 months

Figure 6-3 Lubrication Schedule

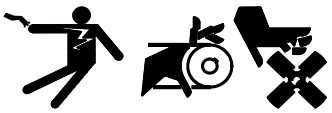
- A clean engine cooling system prolongs the life and increases the efficiency of your power unit. A rust inhibitor should be used in new installations and after each cleaning. A radiator flush solution is also suggested for use during scheduled maintenance. Many commercially available products may be used.
- Check the bolt torque of the motor mount at regular intervals to prevent changes in alignment and possible damage to the equipment. If bolts and nuts are replaced, be sure to use a washer and or flanged bolt and nut. Use Figure 6-4 below to determine the proper torque.

Bolt Size	Torque - Nm (ft-lb)
5/16 in.	33.9 (25)
3/8 in.	61.0 (45)
1/2 in.	128.8 (95)
5/8 in.	264.4 (195)
3/4 in.	494.9 (365)

Figure 6-4 Lubricant Quantities

6.7.7 Radiator Fan Bearing Lubrication

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

The system should be checked periodically (depending on usage) to prevent equipment damage or failure.

- ○ Check and maintain alignment of sheaves by adjusting their location on fan shaft and idler shaft.
- ○ Check and maintain correct tension of fan belts by adjusting the idler.
- ○ Check for frame imbalance, bearing wear, or loose drive components.

Bearings should be lubricated at regular intervals depending on usage. See Figure 6-5.

Operating Condition	Bearing Temperature	Grease Interval
Clean	0 - 49°C (32 - 120°F) 49 - 71°C (120 - 160°F) 71 - 93°C 160 - 200°F)	6 to 12 months 1 to 3 months 1 to 4 weeks
Dirty	0 - 71°C (32 – 160°F) 71 - 93°C (160 – 200°F)	1 to 4 weeks Daily to 1 week
Moisture	0 - 93°C (32 – 200°F)	Daily to 1 week

Figure 6-5 Bearing Maintenance Chart

The lubricant should be a #2 Lithium–based grease that is formulated from a high quality mineral oil with rust and oxidation inhibitors, EP additives, and a minimum viscosity of 500 SSU at 100 °F. Examples of this type of lubricant are as follows: Texaco Multifak EP2, Mobil Mobilith AW2, Shell Alvania EP2, Chevron Dura Lite EP2, and Amoco Amolith 2EP. Re-lubrication of the bearings should be performed with the bearings rotating, and should be discontinued when clean grease has purged through the seal, regardless of the quantity added. Approximate quantities are listed in Figure 6-6:

Shaft Size	Amount - ml (Oz.)
1-3/16 in. to 1-1/4 in.	.89 (.03)
1-3/8 in. to 1-7/16 in.	1.8 (.06)
1-1/2 in. to 1-11/16 in.	2.4 (.08)
1-3/4 in. to 2 in.	3.0 (.10)
2-3/16 in. to 2-1/2 in.	3.8 (.13)
2-11/16 in. to 3 in.	5.9 (.2)
3-3/16 in. to 3-1/2 in.	8.9 (.3)
3-15/16 in. to 4 in.	14.8 (.5)
4-7/16 in. to 4-1/2 in.	17.7 (.6)
4-15/16 in. to 5 in.	26.6 (.9)

Figure 6-6 Bolt Torque

Lubrication and Drive Belt Adjustment Procedure

1. Remove the generator set from service. Use the following procedure.

   a. Review the precautions at the beginning of this section to avoid accidental starts.

   b. Use the following steps to prevent the starting of the generator set by the remote start/stop switch.

      - Disconnect remote control via RS232 line.
      - Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

   c. If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button.

   d. If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set.

      Note: For the Stop button to function, the controller must be in MAN mode.

   e. Place the controller into OFF Mode.

   f. Disconnect the power to the battery charger, if equipped.

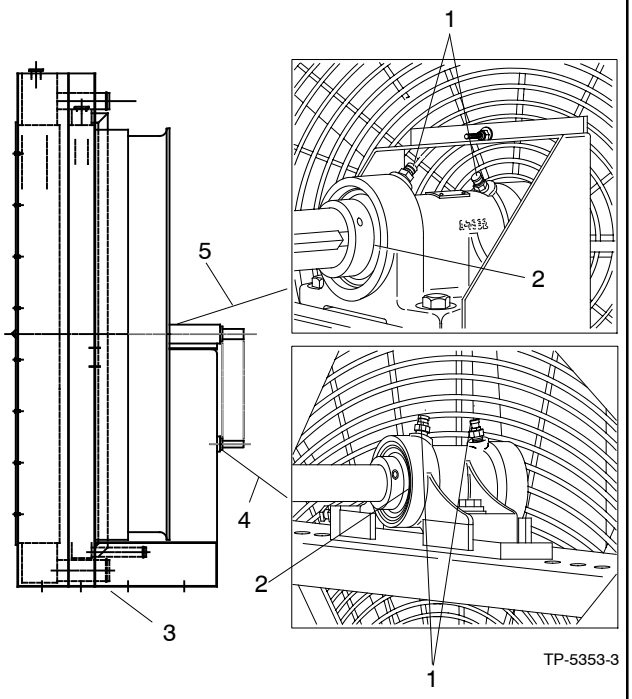
   g. Remove the battery cables, negative (–) lead first.

2. Remove the belt guards to expose the fan shaft and idler shaft bearings.

3. Inject grease into the two bearings on the fan shaft block and the two bearings on the idler shaft block using a grease gun until a 3–6 mm (0.13–0.25 in.) grease column shows at the bearing pressure relief port. See Figure 6-7.

   Note: The fan shaft and idler shaft bearings have pressure relief ports to prevent bearing damage caused by overlubrication.

4. Remove excess grease from the bearing pressure relief ports.



1. Grease fittings
2. Pressure relief port
3. Radiator assembly
4. Idler shaft grease fittings
5. Fan shaft grease fittings

Figure 6-7 Radiator Fan Bearings and Pressure Relief Ports, Typical

5. Inspect the fan drive belt and replace if it is damaged or worn.

6. Check the fan belt tension and adjust the tension, if necessary. Refer to Figure 6-8. Measure the belt span (center line of pulley #1 to center line of pulley #2).

7. Determine the middle of the belt from the measurement taken in step 6.

8. Press on the V–Belt at the middle point and measure the deflection from its original position.

9. For the maximum deflection, refer to Figure 6-8.

Model	Tension N (lbs)	Deflection mm (in)
GM100760-KP1 (400REZCK)	29 (6.5)	12 (0.47)
GM99318-KP1 (500REZK)	40 (9.1)	12 (0.46)
GM100761-KP1 (600REZCK)	36 (8.0)	14 (0.54)
GM99319-KP1 (750REZK)	40 (8.9)	14 (0.54)
GM100762-KP1 (800REZCK)	28 (6.2)	15 (0.59)
GM100763-KP1 (1000REZCK)	39 (8.8)	16 (0.64)
GM94906-KP1 (1000REZK)	44 (9.9)	15 (0.59)
GM98851-KP1 (1300REZCK)	37 (8.4)	12 (0.49)
Note: Belt Tension shown is for used belt(s). Multiply the Newtons/pounds of Force shown by 1.5 for new belt installation.		

Figure 6-8 Belt Tension and Deflection

10. Make the necessary adjustments to the motor mounts until belt deflection falls into the displacement range listed in step 9.
11. Check the pulley alignment on the motor shaft for angularity.
12. Adjust the motor and pulley to eliminate or reduce the pulley angularity.
13. Engage power to motor and observe belt tracking in pulley V-Groove and for excessive belt deflection during operation.
14. Turn OFF the power to the motor.
15. Make the necessary adjustments to the motor mount to achieve optimum performance.
16. Reinstall the belt guards using the original hardware.
17. Reconnect the generator set engine starting battery(ies), negative (-) lead last.
18. Test run the generator set for a few minutes and listen for belt noise (squeal) indicating a slipping belt. Stop the generator set.

If the belt slips after the belt tension procedure, clean the pulley surfaces and repeat the belt tension procedure. If slippage continues, replace the fan belt.

6.8 Battery

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

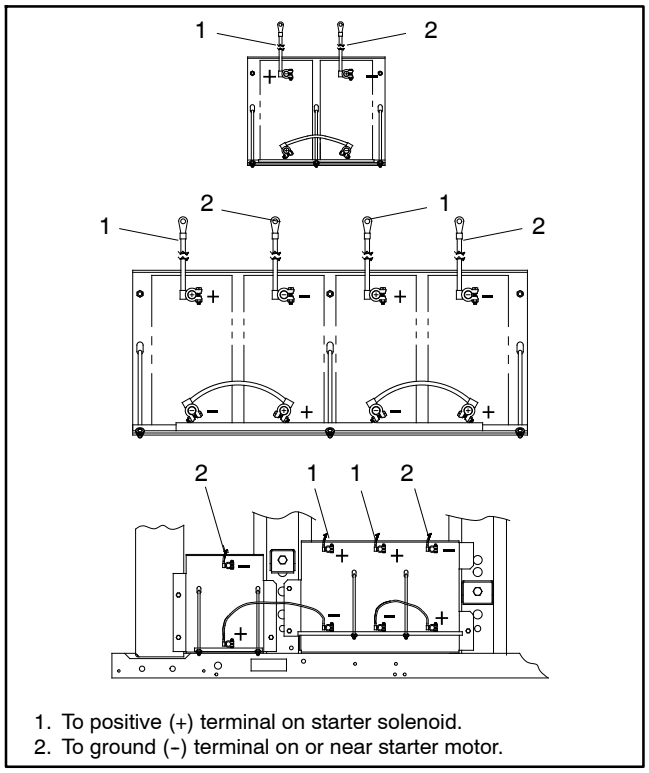
Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

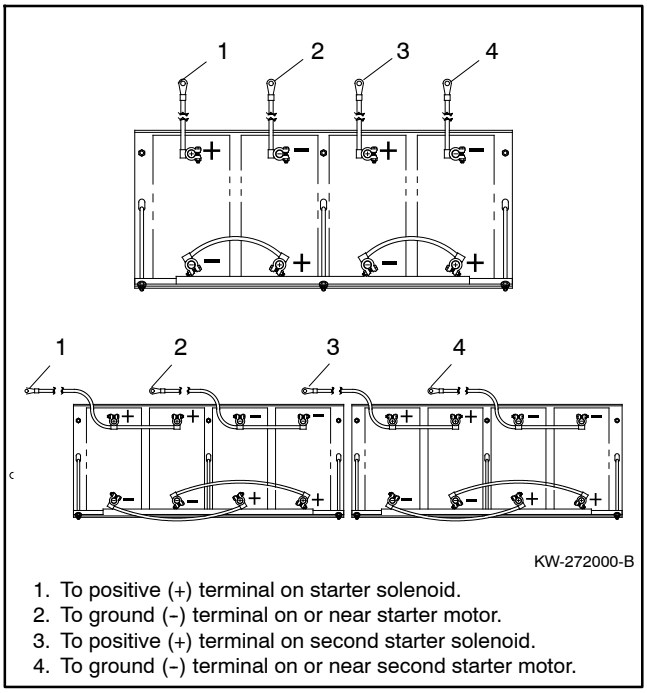
Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

Refer to this section for general battery information and maintenance. All generator set models use a negative ground with a 24-volt engine electrical system. Consult the generator set nameplate for the engine electrical system voltage. Consult the generator set spec sheet for battery capacity recommendations for replacement purposes. The wiring diagrams provide battery connection information. See Figure 6-9, and Figure 6-10 for typical battery connections, including multiple battery configurations.



1. To positive (+) terminal on starter solenoid.
2. To ground (–) terminal on or near starter motor.

Figure 6-9 24-Volt Engine Electrical System Single Starter Motor Typical Battery Connection



1. To positive (+) terminal on starter solenoid.
2. To ground (–) terminal on or near starter motor.
3. To positive (+) terminal on second starter solenoid.
4. To ground (–) terminal on or near second starter motor.

Figure 6-10 24-Volt Engine Electrical System Dual Starter Motors Typical Battery Connections

6.8.1 Clean Battery

Clean the battery and cables and tighten the battery terminals according to the service schedule recommendations. Clean the battery by wiping it with a damp cloth. Keep the electrical connections dry and tight.

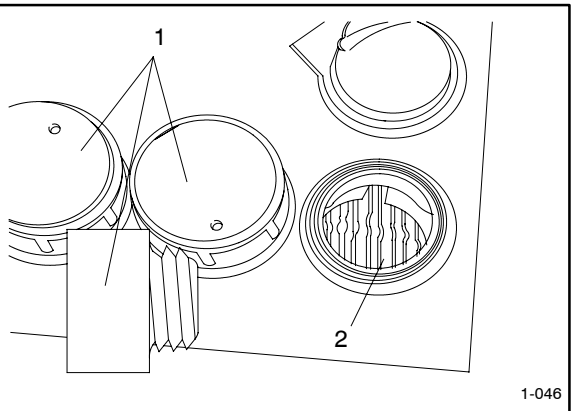
If corrosion exists, disconnect the cables from the battery and remove the corrosion with a wire brush. Clean the battery and cables with a solution of baking soda and water. Do not allow the cleaning solution to enter battery cells. Flush the battery and cables with clean water and wipe the battery with a dry cloth.

After reconnecting the battery cables, coat the terminals with petroleum jelly, silicon grease, or other nonconductive grease.

6.8.2 Electrolyte Level Inspection

Check the electrolyte level and specific gravity of batteries that have filler caps. Maintenance-free batteries do not require electrolyte level checking or specific gravity testing.

Check the electrolyte level at the specified interval. Remove the filler caps and verify that the electrolyte level reaches the bottom of each filler hole. See Figure 6-11. Refill as necessary with distilled water or clean tap water. Do not add fresh electrolyte. Tighten the filler caps. After adding water during freezing temperatures, run the generator set 20–30 minutes to mix the electrolyte and the water to prevent battery damage from freezing.



1. Filler caps
2. Electrolyte level

Figure 6-11 Battery Electrolyte Level Inspection

6.8.3 Specific Gravity Check

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell of batteries with filler caps. Holding the hydrometer vertically, read the number on the glass bulb at the top of the electrolyte level or the number adjacent to the pointer. If the hydrometer used does not have a correction table, consult Figure 6-13. Determine the specific gravity and electrolyte temperature of the battery cells. Locate the temperature in Figure 6-13 and correct the specific gravity by the amount shown. The battery is fully charged if the specific gravity is 1.260 at an electrolyte temperature of 26.7°C (80°F). Maintain the specific gravities between cells within ±0.01 of each other. Charge the battery if the specific gravity is below 1.215 at an electrolyte temperature of 26.7°C (80°F).

Note: Some battery testers have four or five beads in a test tube. Draw electrolyte into the tube as with the battery hydrometer described in this section or use the manufacturer's instructions. Use Figure 6-12 to interpret typical test results.

Number of Floating Beads	Battery Condition
5	Overcharged
4	Fully charged
3	A good charge
1 or 2	A low charge
0	A dead battery

Figure 6-12 Bead-Type Test Interpretation

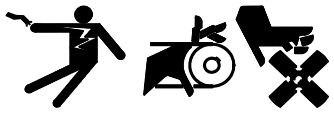
6.8.4 Charge Battery

Refer to the battery charger operation manual for installation, operation, and service procedures.

6.9 Storage Procedure

For the radiator cooling system, generator set exterior, battery, and fuel system, use the following procedures. Refer to engine operation manual for any engine related storage procedures. Perform the following storage procedures before taking a generator set out of service for three months or longer.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

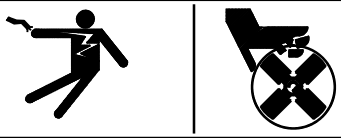
⚠ WARNING

Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

⚠ DANGER



Hazardous voltage. Moving parts.
Will cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

Servicing the generator set when it is operating. Exposed moving parts will cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

6.9.1 Cooling System

Prepare the cooling system for storage as follows:

1. Check the coolant freeze protection using a coolant tester.
2. Add or replace coolant as necessary to ensure adequate freezing protection. Use the guidelines included in the engine operation and maintenance manual.
3. Run the generator set for 30 minutes to redistribute added coolant.

6.9.2 Fuel System

Prepare the fuel system for storage as follows:

1. Start the generator set.
2. With the generator set running, shut off the gas supply.
3. Run the generator set until the engine stops.
4. Stop the generator set.

6.9.3 Exterior

1. Clean the exterior surface of the generator set.
2. Seal all engine openings except for the air intake with nonabsorbent adhesive tape.
3. To prevent impurities from entering the air intake and to allow moisture to escape from the engine, secure a cloth over the air intake.
4. Mask electrical connections.
5. Spread a light film of oil over unpainted metallic surfaces to inhibit rust and corrosion.

6.9.4 Alternator

If stored for over one year, perform a high voltage resistance test to determine the quality of the winding insulation before placing the generator set into service. Measure and record resistance readings of windings with insulation tester (Megger®, with SCR assembly or rectifier disconnected).

6.9.5 Battery

Perform battery storage after all other storage procedures.

1. Confirm that the generator set is stopped.
2. Disconnect the battery(ies), negative (–) lead first.
3. Clean the battery. Refer to Section 6.8.1 for the battery cleaning procedure.
4. Place the battery in a cool, dry location.
5. Connect the battery to a float/equalize battery charger or charge it monthly with a trickle battery charger. Refer to the battery charger manufacturer's recommendations.

   Maintain a full charge to extend battery life.

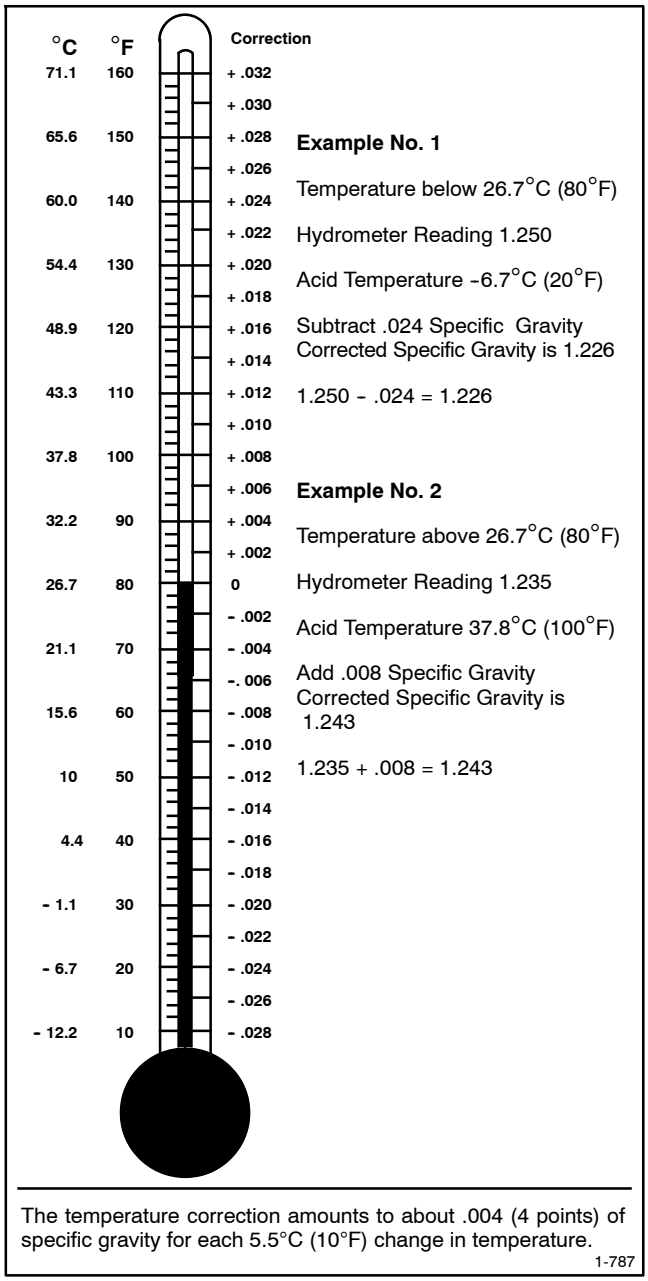


Figure 6-13 Specific Gravity Temperature Correction

Megger® is a registered trademark of Biddle Instruments.

Notes

7.1 Introduction

Use the following voltage reconnection procedure to change the voltage of 10- and 12-lead generator sets. Frequency changes require voltage regulator *and* governor adjustments. Refer to the respective spec sheet to determine if frequency is fixed or field-convertible. If frequency is adjustable, refer to the engine service manual and/or governor literature for conversion information.

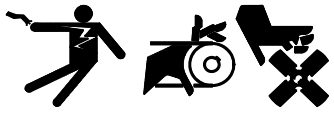
Refer to the following procedure and the connection schematics. Follow the safety precautions at the front of this manual and in the procedure text and observe National Electrical Code (NEC) guidelines.

NOTICE

Voltage reconnection. Affix a notice to the generator set after reconnecting the set to a voltage different from the voltage on the nameplate. Order voltage reconnection decal 246242 from an authorized service distributor/ dealer.

Note: Equipment damage. Verify that the voltage ratings of the transfer switch, line circuit breakers, and other accessories match the selected line voltage. Decision-Maker® 8000 settings, voltage regulator settings, and generator set equipment such as the current transformers may also require changes to avoid equipment damage. Contact an authorized service distributor/ dealer for more information.

⚠ WARNING



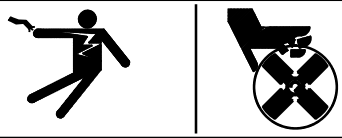
Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button. (2) If the generator set is running, press and hold the Manual–Stop button for at least 2 seconds to stop the generator set. (3) Press the Controller Mode button and then press the controller Off mode button. (4) Disconnect the power to the battery charger, if equipped. (5) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

The Decision-Maker® 8000 controller can be remotely controlled. Accidental starting can cause severe injury or death. In the event that maintenance needs to be done to the generator set, check the following to ensure that the engine cannot be started remotely: (1) Disconnect remote control via RS-232 line. (2) Disconnect input REMOTE START/STOP or disconnect output STARTER and outputs GCB CLOSE/OPEN.

⚠ DANGER



Hazardous voltage. Moving parts.
Will cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

Grounding electrical equipment. Hazardous voltage will cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Short circuits. Hazardous voltage/current will cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

7.2 Voltage Reconnection Procedure

1. Use the following procedure to disable the generator set:

   a. If the controller is not already in the MAN (manual) mode, press the Controller Mode button and then press the MAN mode button.

   b. If the generator set is running, press and hold the Stop button for at least 2 seconds to stop the generator set.

   c. Press the Controller Mode button and then press the controller Off mode button.

   d. Disconnect the generator set engine starting battery, negative (-) lead first. Disconnect power to the battery charger (if equipped).

2. Use Figure 7-1 to determine the generator set voltage configuration. Note the original voltage and reconnect as needed. Route leads through current transformers (CTs) and connect them according to the diagram for the desired phase and voltage.

   Note: Position current transformers CT1, CT2, and CT3 with the dot or HI side CT marking toward the generator set.

   Important: Current transformers may need to be changed to avoid equipment damage. Contact an authorized service distributor/ dealer for more information.

3. Reconnect the battery, negative lead last.

4. To update the setpoints for the Decision-Maker® 8000, a new configuration file (.ANT) is required. Contact an authorized service distributor/ dealer to obtain the configuration file. Refer to the controller service Manual for procedures on using FlashPrg software to import setpoints using the configuration (.ant) file.

5. To update the voltage regulator settings, refer to the Digital Voltage Regulator Installation, Operation, and Service Manual and the preliminary setup procedure.

6. Use the following procedure to check for correct voltage output:

   a. Ensure all loads are disconnected by opening the generator circuit breaker.

   b. Set the controller to MAN mode and press the Start button to run the generator set.

   c. Check the metering menus on the controller for the correct voltage output.

7. Press the Stop button to stop the generator set after completing the voltage adjustments.

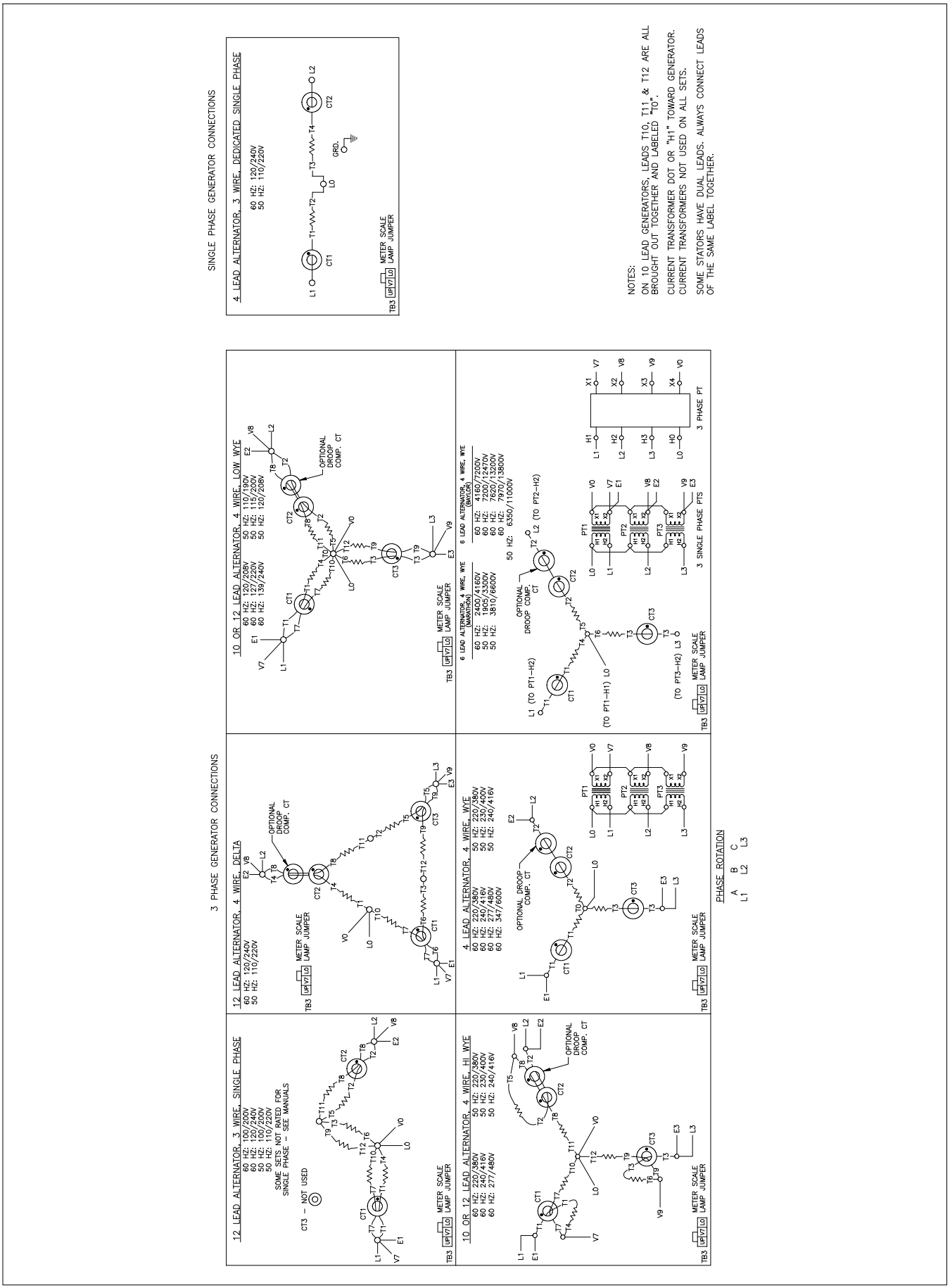


Figure 7-1 300 kW and Larger Pilot-Excited, Permanent Magnet 4M/5M/7M/10M Alternators, ADV-5875U-4

Notes

Section 8 General Troubleshooting

This section contains generator set troubleshooting, diagnostic, and repair information.

Use the following charts to diagnose and correct common problems. First check for simple causes such as a dead engine starting battery or an open circuit breaker. The charts include a list of common problems, possible causes of the problem, recommended corrective actions, and references to detailed information or repair procedures.

Maintain a record of repairs and adjustments performed on the equipment. If the procedures in this manual do not explain how to correct the problem, contact an authorized distributor/dealer. Use the record to help describe the problem and repairs or adjustments made to the equipment.

8.1 General Troubleshooting Chart

Trouble Symptoms												Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
Alternator														
			x									AC output circuit breaker open	Reset the breaker and check for AC voltage at the generator set side of the circuit breaker.	—
x												Transfer switch test switch in the OFF position	Move the transfer switch test switch to the AUTO position.	ATS O/M
			x									Transfer switch fails to transfer load	Move the ATS test switch to the AUTO position. Troubleshoot the transfer circuit and time delays.	ATS O/M, S/M
			x									Wiring, terminals, or pin in the exciter field open	Check for continuity.	Controller S/M, W/D
			x									Main field (rotor) inoperative (open or grounded)	Test and/or replace the rotor.†	Controller S/M
			x									Stator inoperative (open or grounded)	Test and/or replace the stator.†	Controller S/M
									x			Vibration excessive	Tighten loose components.†	—
			x									Voltage regulator digital settings incorrect	Adjust the voltage regulator.	DVR O/M
Electrical System (DC Circuits)														
x	x											Battery connections loose, corroded, or incorrect	Verify that the battery connections are correct, clean, and tight.	Section 3
x	x											Battery weak or dead	Recharge or replace the battery. The spec sheet provides recommended battery CCA rating.	Section 3, S/S
x	x											Starter/starter solenoid inoperative	Replace the starter or starter solenoid.†	Eng. S/M
x				x								Engine harness connector(s) not locked tight	Disconnect the engine harness connector(s) then reconnect it to the controller.	W/D
				x								High water temperature sensor inoperative	Replace the inoperative sensor.	Controller S/M or W/D
				x								Fault shutdown	Reset the faults and troubleshoot the controller.	Section 2
				x								High exhaust temperature switch inoperative	Replace the inoperative sensor.	Controller S/M or W/D

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram Manual

† Have a certified Kohler technician perform this service.

Trouble Symptoms												Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
Controller														
				x								Controller fault	Troubleshoot the controller.†	Controller S/M
x												Controller buttons inoperative	• Controller is not in MAN mode. • Clear any alarms and retry the buttons. • Check that **Local button** setpoint under the Basic settings is set to **BOTH**.	—
x												Controller set to OFF mode	Change the controller mode to MAN or AUT	Section 2
x												Engine start circuit open	Place the controller in AUT mode to test the generator set. Troubleshoot the auto start circuit and time delays.	Section 2, W/D, Gen. I/M, S/M ATS O/M, S/M
											x	Controller clock not set	Reset time and date.	See date and time setpoints in Appendix B.
												If setpoints cannot be changed, the setpoint is password protected.	• Login with username and password. • If setpoint is locked when logged in, request higher access rights from system admin.	
												If controller mode cannot be changed, the **ControllerMode** setpoint, under Basic settings, is password protected.	• Login with username and password. • If setpoint is locked when logged in, request higher access rights from system admin.	

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram Manual

† Have a certified Kohler technician perform this service.

Trouble Symptoms												Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
Engine														
	x	x			x			x				Air cleaner clogged	Clean or replace the filter element.	Eng. O/M
			x		x	x		x	x			Engine overload	Reduce the electrical load. See the generator set spec sheet for wattage specifications.	S/S
									x			Exhaust system leak	Inspect the exhaust system. Replace the inoperative exhaust system components.†	I/M
									x			Exhaust system not securely installed	Inspect the exhaust system. Tighten the loose exhaust system components.†	I/M
									x			Vibration excessive	Tighten all loose hardware.	—
	x	x			x							Ignition system inoperative	Check the ignition system (spark plugs, spark plug wires, etc.).†	Eng. O/M
		x	x		x			x				Governor inoperative	Adjust the governor.†	Controller S/M
					x				x			Valve clearance incorrect	Adjust the valves.†	Eng. S/M
	x	x				x		x	x			Compression weak	Check the compression.†	Eng. S/M

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram Manual

† Have a certified Kohler technician perform this service.

Trouble Symptoms												Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
Cooling System														
						x		x				Air openings clogged	Clean the air openings.	—
						x						Coolant level low	Restore the coolant to normal operating level.	Section 3
				x								High temperature shutdown	Allow the engine to cool down. Then troubleshoot the cooling system.	Sec. 3, Eng. O/M
				x								Low coolant level shutdown, if equipped	Restore the coolant to normal operating level.	Section 3
						x						Thermostat inoperative	Replace the thermostat.	Eng. S/M
Fuel System														
	x			x								Fuel valve shut off	Move the fuel valve to the ON position.	—
	x	x		x	x							Fuel filter restriction	Clean or replace the fuel filter.	Eng. O/M
	x											Fuel solenoid inoperative	Troubleshoot the fuel solenoid.†	Eng. S/M
	x				x							Fuel pressure insufficient	Check the fuel supply and valves.†	S/S, Gen. O/M
Lube System														
						x	x		x			Oil level low	Restore the oil level. Inspect the generator set and oil makeup kit for oil leaks.	Eng. O/M
				x								Low oil pressure shutdown	Check the oil level.	Eng. O/M

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram Manual

† Have a certified Kohler technician perform this service.

Notes

9.1 Accessories and Connections

Several accessories help finalize installation, add convenience to operation and service, and establish state and local code compliance.

Accessories vary with each generator set model. Select factory-installed and/or shipped-loose accessories. Obtain the most current accessory information from your local authorized service distributor/dealer.

This section illustrates several accessories available at print time of this publication. Accessory kits generally include installation instructions. See wiring diagrams manual for electrical connections not shown in this section. See the installation instructions and drawings supplied with kit for information on kit mounting location.

The instructions provided with the accessory kit supersede these instructions where there are differences. In general, run AC and DC wiring in separate conduit. Use shielded cable for all analog inputs. Observe all applicable national, state, and local electrical codes during accessory installation.

9.1.1 Remote Emergency Stop Kit

The emergency stop kit allows immediate shutdown of the generator set from a remote location. See Figure 9-1. If the emergency stop switch activates, the controller Alarm LED light flashes red and the Emergency Stop alarm is displayed on the controller. Before attempting to restart the generator set, reset the emergency stop switch (by replacing the glass piece) and reset the generator set (see Section 4.4.12, Emergency Stop Switch Reset Procedure).

Use the single glass piece located inside the switch for replacement and order additional glass pieces as service parts of the sentence: See Figure 9-2, Accessory Connections, for terminal identifications.

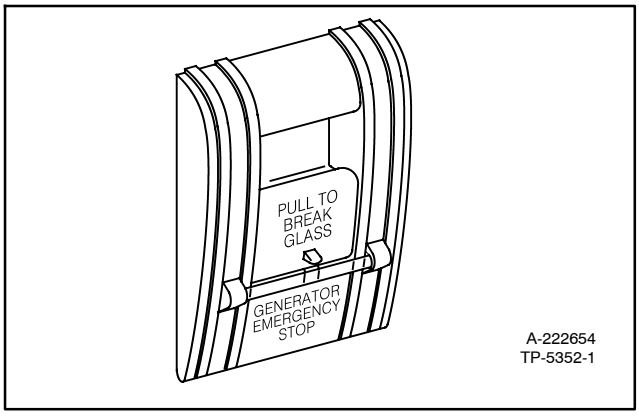


Figure 9-1 Emergency Stop Kit

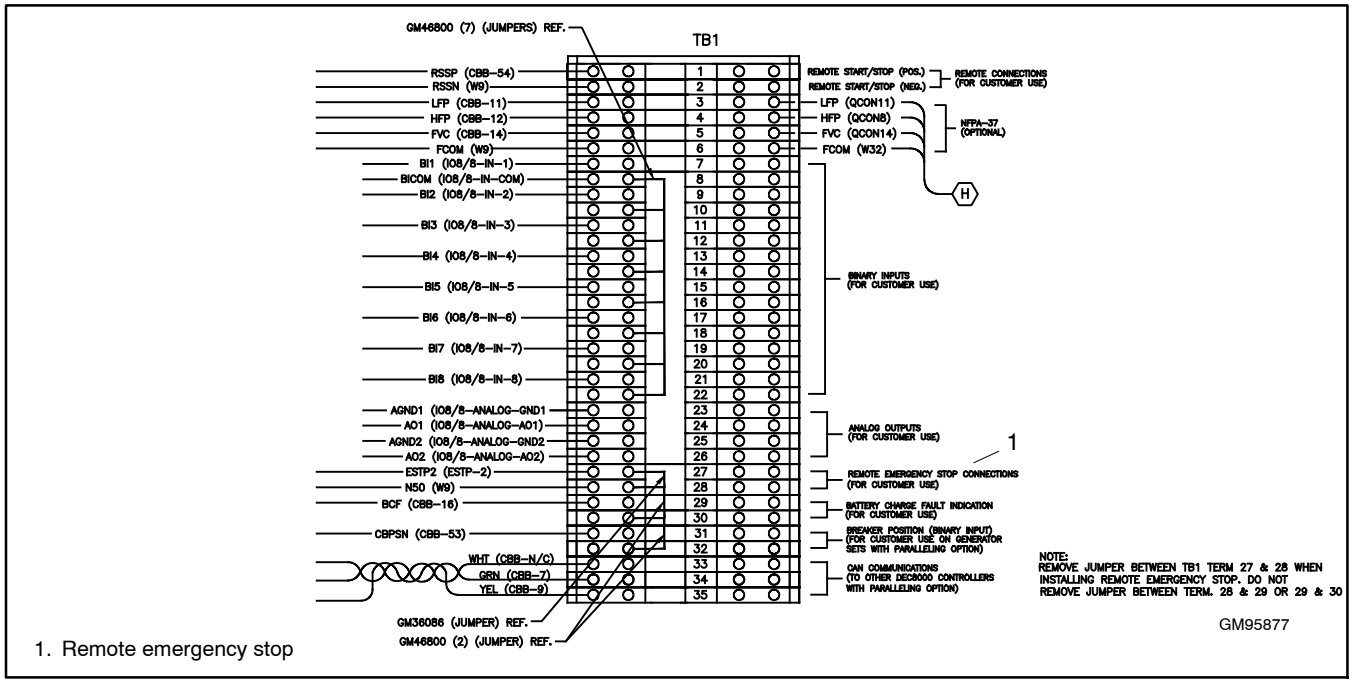
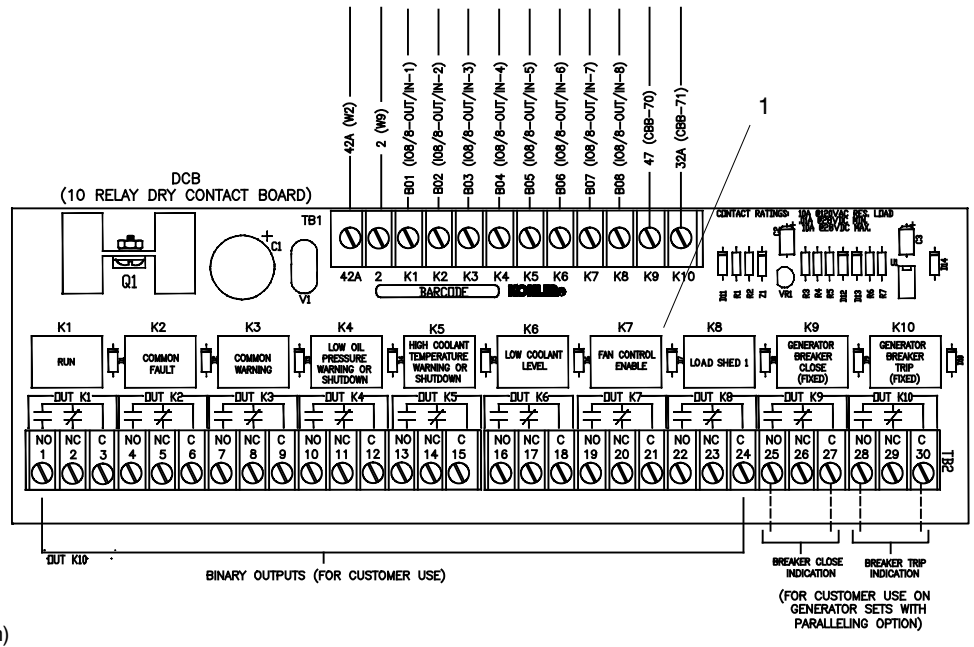


Figure 9-2 Customer Connection Terminal Block

9.1.2 Soft Starter Kit

For the remote radiator kit, a soft starter is recommended to control the fan motor. See Figure 9-3. The use of a soft starter will reduce wear on the fan motor and V-belt and will also reduce maximum load during fan motor startup. Refer to the soft starter kit instructions for mounting and wiring.

Use the Fan Control Enable output relay to enable the fan operation through a contactor or soft starter kit.



1. Fan control enable (soft starter connection)

Figure 9-3 Dry Contact Board

Appendix A Abbreviations

The following list contains abbreviations that may appear in this publication.

A, amp	ampere
ABDC	after bottom dead center
AC	alternating current
A/D	analog to digital
ADC	advanced digital control; analog to digital converter
adj.	adjust, adjustment
ADV	advertising dimensional drawing
Ah	amp-hour
AHWT	anticipatory high water temperature
AI	Anolog Input
AISI	American Iron and Steel Institute
ALOP	anticipatory low oil pressure
alt.	alternator
Al	aluminum
AMF	Auto Mains Failure
ANSI	American National Standards Institute (formerly American Standards Association, ASA)
AO	anticipatory only
AO	Analog Output
APDC	Air Pollution Control District
API	American Petroleum Institute
approx.	approximate, approximately
APU	Auxiliary Power Unit
AQMD	Air Quality Management District
AR	as required, as requested
AS	as supplied, as stated, as suggested
ASE	American Society of Engineers
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
ATS	automatic transfer switch
auto.	automatic
aux.	auxiliary
avg.	average
AVR	automatic voltage regulator
AWG	American Wire Gauge
AWM	appliance wiring material
bat.	battery
BBDC	before bottom dead center
BC	battery charger, battery charging
BCA	battery charging alternator
BCI	Battery Council International
BDC	before dead center
BHP	brake horsepower
BI	Binary Input
blk.	black (paint color), block (engine)
blk. htr.	block heater
BMEP	brake mean effective pressure
BO	Binary Output
BOC	Breaker Open & Cool-down-protection type
bps	bits per second
br.	brass
BTB	Bus-Tie Breaker
BTDC	before top dead center
Btu	British thermal unit
Btu/min.	British thermal units per minute
C	Celsius, centigrade
cal.	calorie
CAN	controller area network
CARB	California Air Resources Board
CAT5	Category 5 (network cable)
CB	circuit breaker
CC	crank cycle
cc	cubic centimeter
CCA	cold cranking amps
ccw.	counterclockwise
CEC	Canadian Electrical Code
cert.	certificate, certification, certified
cfh	cubic feet per hour
cfm	cubic feet per minute
CG	center of gravity
CID	cubic inch displacement
CL	centerline
cm	centimeter
CMOS	complementary metal oxide substrate (semiconductor)
com	communications (port)
Combi	Application where SPTM, SPI or MINT can be used. Application is defined by Binary inputs combination.
coml	commercial
Coml/Rec	Commercial/Recreational
conn.	connection
cont.	continued
COX	Application for complex systems where actions are taken by a PLC and the controller only follows the orders=> needs an external driver (cox)
COP	Continuous power
CPVC	chlorinated polyvinyl chloride
crit.	critical
CSA	Canadian Standards Association
CT	current transformer
Cu	copper
cUL	Canadian Underwriter's Laboratories
CUL	Canadian Underwriter's Laboratories
cu. in.	cubic inch
cw.	clockwise
CWC	city water-cooled
cyl.	cylinder
D/A	digital to analog
DAC	digital to analog converter
dB	decibel
dB(A)	decibel (A weighted)
DC	direct current
DCR	direct current resistance
deg., °	degree
dept.	department
dia.	diameter
DI/EO	dual inlet/end outlet
DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
DIP	dual inline package
DPDT	double-pole, double-throw
DPST	double-pole, single-throw
DS	disconnect switch
DVR	digital voltage regulator
E^2PROM, EEPROM	electrically-erasable programmable read-only memory
E, emer.	emergency (power source)
ECM	electronic control module, engine control module
EDI	electronic data interchange
EFR	emergency frequency relay
e.g.	for example (*exempli gratia)*
EG	electronic governor
EGSA	Electrical Generating Systems Association
EIA	Electronic Industries Association
EI/EO	end inlet/end outlet
EMI	electromagnetic interference
emiss.	emission
eng.	engine
EPA	Environmental Protection Agency
EPS	emergency power system
ER	emergency relay
ES	engineering special, engineered special
ESD	electrostatic discharge
ESF	Engine Specific File
ESP	Emergency standby power
est.	estimated
E-Stop	emergency stop
etc.	et cetera (and so forth)
exh.	exhaust
ext.	external
F	Fahrenheit, female
FHM	flat head machine (screw)
FLS	Sensor fail detection
FMI	Failure Mode Identifier
fl. oz.	fluid ounce
flex.	flexible
freq.	frequency
FS	full scale
ft.	foot, feet
ft. lb.	foot pounds (torque)
ft./min.	feet per minute
ftp	file transfer protocol
g	gram
ga.	gauge (meters, wire size)
gal.	gallon
GC	Graphical Characters
GCB	Generator Circuit Breaker
gen.	generator
genset	generator set
GFI	ground fault interrupter
GND, ⏚	ground
gov.	governor
gph	gallons per hour
gpm	gallons per minute
gr.	grade, gross
GRD	equipment ground
gr. wt.	gross weight
H x W x D	height by width by depth
HC	hex cap
HCHT	high cylinder head temperature
HD	heavy duty
HET	high exhaust temp., high engine temp.
hex	hexagon
Hg	mercury (element)
HH	hex head
HHC	hex head cap
HP	horsepower
hr.	hour
HS	heat shrink
hsg.	housing
HVAC	heating, ventilation, and air conditioning
HWT	high water temperature
Hz	hertz (cycles per second)
IBC	International Building Code
IC	integrated circuit
ID	inside diameter, identification

IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMS	improved motor starting
in.	inch
in. H_2O	inches of water
in. Hg	inches of mercury
in. lb.	inch pounds
Inc.	incorporated
ind.	industrial
int.	internal
int./ext.	internal/external
I/O	input/output
IP	internet protocol
ISO	International Organization for Standardization
J	joule
JIS	Japanese Industry Standard
k	kilo (1000)
K	kelvin
kA	kiloampere
KB	kilobyte (2^{10} bytes)
KBus	Kohler communication protocol
kg	kilogram
kg/cm^2	kilograms per square centimeter
kgm	kilogram-meter
kg/m^3	kilograms per cubic meter
kHz	kilohertz
kJ	kilojoule
km	kilometer
kOhm, kΩ	kilo-ohm
kPa	kilopascal
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt ampere
kVAR	kilovolt ampere reactive
kW	kilowatt
kWh	kilowatt-hour
kWm	kilowatt mechanical
kWth	kilowatt-thermal
L	liter
LAN	local area network
L x W x H	length by width by height
lb.	pound, pounds
lbm/ft^3	pounds mass per cubic feet
LCB	line circuit breaker
LCD	liquid crystal display
LED	light emitting diode
Lph	liters per hour
Lpm	liters per minute
LOP	low oil pressure
LP	liquefied petroleum
LPG	liquefied petroleum gas
LS	left side
LS	Load Sharing
LSM	Load Sharing Module
LT	Low Temperature
L_{wa}	sound power level, A weighted
LWL	low water level
LWT	low water temperature
m	meter, milli (1/1000)
M	mega (10^6 when used with SI units), male
m^3	cubic meter
$m^3/hr.$	cubic meters per hour
$m^3/min.$	cubic meters per minute
mA	milliampere
man.	manual
max.	maximum
MB	megabyte (2^{20} bytes)
MCCB	molded-case circuit breaker
MCB	Main Circuit Breaker
MCM	one thousand circular mils
meggar	megohmmeter
MGCB	Master Generator Circuit Breaker
MHz	megahertz
mi.	mile
mil	one one-thousandth of an inch
min.	minimum, minute
MINT	Multiple application with INTernal control loops
misc.	miscellaneous
MJ	megajoule
mJ	millijoule
mm	millimeter
mOhm, mΩ	milliohm
MOhm, MΩ	megohm
MOV	metal oxide varistor
MP	Mains Protection
MPa	megapascal
mpg	miles per gallon
mph	miles per hour
MPU	Mains Protection Relay
MS	military standard
ms	millisecond
m/sec.	meters per second
mtg.	mounting
MTU	Motoren-und Turbinen-Union
MW	megawatt
mW	milliwatt
μF	microfarad
N, norm.	normal (power source)
NA	not available, not applicable
nat. gas	natural gas
NBS	National Bureau of Standards
NC	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	newton meter
NO	normally open
no., nos.	number, numbers
NPS	National Pipe, Straight
NPSC	National Pipe, Straight-coupling
NPT	National Standard taper pipe thread per general use
NPTF	National Pipe, Taper-Fine
NR	not required, normal relay
ns	nanosecond
OC	Occurrence Count
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OF	overfrequency
OfL	Off load
opt.	option, optional
OS	oversize, overspeed
OSHA	Occupational Safety and Health Administration
OV	overvoltage
oz.	ounce
p., pp.	page, pages
PC	personal computer
PCB	printed circuit board
PGN	Parameter Group Number
pF	picofarad
PF	power factor
ph., ∅	phase
PHC	Phillips® head Crimptite® (screw)
PHH	Phillips® hex head (screw)
PHM	pan head machine (screw)
PLC	programmable logic control
PMG	permanent magnet generator
PMS	Power Management System
pot	potentiometer, potential
ppm	parts per million
PROM	programmable read-only memory
PRP	Prime power
psi	pounds per square inch
psig	pounds per square inch gauge
pt.	pint
PTC	positive temperature coefficient
PTO	power takeoff
PVC	polyvinyl chloride
qt.	quart, quarts
qty.	quantity
R	replacement (emergency) power source
rad.	radiator, radius
RAM	random access memory
RDO	relay driver output
ref.	reference
rem.	remote
Res/Coml	Residential/Commercial
RFI	radio frequency interference
RH	round head
RHM	round head machine (screw)
rly.	relay
rms	root mean square
rnd.	round
RO	read only
ROM	read only memory
rot.	rotate, rotating
rpm	revolutions per minute
RS	right side
RTDs	Resistance Temperature Detectors
RTU	remote terminal unit
RTV	room temperature vulcanization
RW	read/write
SAE	Society of Automotive Engineers
scfm	standard cubic feet per minute
SCR	silicon controlled rectifier
s, sec.	second
SHAIN	Shared (virtual) Analog INput module
SHAOUT	Shared (virtual) Analog OUTput module
SHBIN	SHared (virtual) Binary INput Module
SHBOUT	SHared (virtual) Binary OUTput Module
SI	*Systeme international d'unites,* International System of Units
SI/EO	side in/end out
sil.	silencer
SMTP	simple mail transfer protocol
SN	serial number
SNMP	simple network management protocol
SPDT	single-pole, double-throw
SPST	single-pole, single-throw
spec	specification
specs	specification(s)
SPI	Single Parallel Island application
SPM	Single Prime Mover Application
SPN	Suspect Parameter Number
SPtM	Single Parallel to Mains application
sq.	square
sq. cm	square centimeter
sq. in.	square inch
SMS	short message service
SS	stainless steel
std.	standard
stl.	steel
tach.	tachometer
TB	terminal block
TCP	transmission control protocol
TD	time delay
TDC	top dead center
TDEC	time delay engine cooldown
TDEN	time delay emergency to normal

TDES	time delay engine start
TDNE	time delay normal to emergency
TDOE	time delay off to emergency
TDON	time delay off to normal
temp.	temperature
term.	terminal
THD	total harmonic distortion
TIF	telephone influence factor
tol.	tolerance
turbo.	turbocharger
typ.	typical (same in multiple locations)
UF	underfrequency
UHF	ultrahigh frequency
UIF	user interface
UL	Underwriter's Laboratories, Inc.
UNC	unified coarse thread (was NC)
UNF	unified fine thread (was NF)
univ.	universal
URL	uniform resource locator (web address)
US	undersize, underspeed
UV	ultraviolet, undervoltage
V	volt
VAC	volts alternating current
VAR	voltampere reactive
VDC	volts direct current
VFD	vacuum fluorescent display
VGA	video graphics adapter
VHF	very high frequency
VS	VAr Sharing
W	watt
WCR	withstand and closing rating
w/	with
WO	write only
w/o	without
wt.	weight
xfmr	transformer

Notes

Appendix B User-Defined Settings

Use the tables below to record setpoints during the generator set controller setup and calibration. The controller default settings and ranges provide guidelines. The table contains all faults with ranges and time delays including items that do not have adjustments.

Editing setpoints can significantly change the performance of the generator set. Some setpoints are locked with an administration level password and intended for factory adjustment only. These setpoints are not intended to be adjustable outside the factory setting. See Section 2.10.3 for user access levels and passwords.

In the table, the following abbreviations represent the generator set application for the value shown:

- COP = Continuous Power
- ESP = Emergency Standby Power
- PRP = Prime Power

Setpoints that are marked with # sign at the begin of their names are synchronized with other controllers present on the CAN bus line. See Section 2.7.

Use the setpoint ratings chart to find the numeric value for setpoints as instructed. Ratings can also be found in the generator specification sheet and TIB-102. Some setpoints such as #SysBaseLoad, Nomin power, and Nominal current vary depending upon the unit, application, and voltage rating for the unit.

Setpoint Ratings Chart

Model	Voltage	Nominal Power	Overpower kW	Nominal Current	CT Ratio	P-Rated Current	Exhaust Temperature 40%	Exhaust Temperature 100%
400REZCK (Continuous)	(480V)	435	443	669	1000	523	824°F	768°F
	(600V)	430	438	583	800	414		
500REZK (Emergency Standby)	(208V)	500	510	1821	3000	1735	935 F	840 F
	(220V)	500	510	1837	2000	1640		
	(240V)	500	510	1684	2000	1504		
	(416V)	500	510	910	1200	867		
	(480V)	500	510	842	1000	752		
	(600V)	490	499	722	800	589		
500REZK (Prime)	(208V)	435	487	1771	2000	1509	938 F	847 F
	(220V)	435	487	1756	2000	1427		
	(240V)	435	487	1609	2000	1308		
	(416V)	435	487	885	1200	755		
	(480V)	435	487	805	1000	654		
	(600V)	430	481	692	800	517		
600REZCK (Continuous)	(480V)	675	688	1083	1500	812	793 F	738 F
	(600V)	675	688	842	1000	650		
750REZK (Emergency Standby)	(208V)	750	765	2723	3000	2602	950 F	898 F
	(220V)	750	765	2690	3000	2460		
	(240V)	750	765	2480	3000	2255		
	(416V)	750	765	1449	1600	1301		
	(480V)	750	765	1383	1500	1128		
	(600V)	750	765	1053	1200	902		
750REZK (Prime)	(208V)	630	705	2515	3000	2186	940 F	891 F
	(220V)	630	705	2493	3000	2067		
	(240V)	630	705	2406	3000	1894		
	(416V)	630	705	1337	1600	1093		
	(480V)	630	705	1293	1500	947		
	(600V)	630	705	992	1000	758		
800REZCK (Continuous)	(480V)	875	892	1300	1600	1052	862 F	815 F
	(600V)	875	892	1040	1200	842		
	(4160V)	875	892	160	200	121		

Model	Voltage	Nominal Power	Overpower kW	Nominal Current	CT Ratio	P-Rated Current	Exhaust Temperature 40%	Exhaust Temperature 100%
1000REZK (Emergency Standby)	(416V)	955	974	1692	3000	1657	935 F	840 F
	(480V)	1000	1020	1594	2000	1504		
	(600V)	1000	1020	1323	1500	1203		
	(4160V)	1000	1020	208	250	173		
1000REZK (Prime)	(416V)	809	906	1545	2000	1403	938 F	847 F
	(480V)	880	985	1466	1600	1323		
	(600V)	880	985	1239	1500	1058		
	(4160V)	880	985	194	200	153		
1000REZCK (Continuous)	(480V)	1030	1050	1504	2000	1239	1078 F	984 F
	(600V)	1030	1050	1347	1500	991		
	(4160V)	1030	1050	194	200	143		
1300REZCK (Continuous)	(480V)	1310	1336	1970	3000	1576	530 C	470 C
	(600V)	1310	1336	1564	1500	1261		
	(4160V)	1300	1326	238	250	180		

Process Control

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#SysBaseLoad	0–65000 kW	5	For the default setting, use nominal power. See the ratings chart.		This setpoint is used to adjust the requested load for the whole generator set group in system baseload mode (i.e. #SysLdCtrl PtM = BASELOAD). Each generator set takes proportionally equal part of this total required value. The number of running generator sets is resolved by the power management function according to the requested total load, generator sets nominal power and adjusted reserves.
LocalBaseload	0 – OFF 1 – Nomin Power (the setpoint for nominal rated power)	5	OFF		This setpoint is used to adjust local baseload level. The generator set maintains this load instead of performing proportional load sharing whenever the total load is high enough. Load variations are then equalized by the generator sets with lower priority (higher number) or by generator sets with local baseload switched off. If the setpoint is adjusted to 0 (OFF) the function is off.
#SysPwrFactor	0.6 – 1.2	5	1		The setpoint is used for adjusting the requested generator set power factor during the parallel-to-mains operation if #SysPFCtrl PtM = BASEPF and also during the local baseload operation. Values 0.60 – 0.99 correspond to inductive PF (0.60L – 0.99L), 1.01 – 1.20 correspond to capacitive PF (0.99C – 0.80C). **Note:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#SysLdCtrl PtM	0 – BASELOAD 1 – LDSHARING	5	BASE LOAD		This setpoint is used to adjust the power control mode in parallel-to-mains operation. • BASELOAD: The generator set is controlled by the load control loop (i.e. as in SPtM) to provide constant proportional part of the requested system baseload (see SysBaseLdMode). The proportional parts of all running generator sets are equal relative to their nominal power. • LDSHARING: The generator set load controlled by the load sharing loop as in island operation. This option is intended only for systems with InteliMains, where the InteliMains controls the power of the group via the load sharing line (e.g. in Import/Export mode).
#SysPFCtrl PtM	0 – BASEPF 1 – VSHARING	5	BASEPF		This setpoint is used to adjust the power factor control mode in parallel-to-mains operation. • BASEPF: The generator set power factor is controlled to a preadjusted level #SysPwrFactor. • VSHARING: The power factor is equalized with other generator sets according to the actual reactive load. **Note:** NOTE: If the power factor control mode is switched to VSHARING the load control mode must be switched to LDSHARING.
SysBaseLdMode	0 – INTERNAL 1 – EXTERNAL	5	INTERNAL		This setpoint selects from where the System Base load value is taken if the load control mode in parallel–to–mains operation is switched to baseload (i.e. #SysLdCtrl PtM = BASELOAD). **INTERNAL** The baseload is adjusted by the setpoint #SysBaseLoad. **EXTERNAL** The baseload is adjusted by the logical (functional) analog input MLC:AnExSysBld. **Note:** If the external source is selected the logical analog input must be configured at each generator set to the identical source. The shared peripheral modules can be used to distribute the value over the controllers via the CAN2 bus. • One controller measures the value physically on it's analog input and the function MLC:AnExSysBld is configured onto this physical input. But the value is also being transmitted from this controller to the CAN bus via one shared analog output (e.g. SHAOUT #1.1). • The other controllers reads the value from their shared analog inputs (e.g. SHAIN #1.1) and the function MLC:AnExSysBld is configured onto these shared inputs. • The transmitting controller must be always switched on.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
SysBasePFMode	0 – INTERNAL 1 – EXTERNAL	5	INTERNAL		This setpoint selects from where the System Power Factor value is taken if the PF control mode in parallel-to-mains operation is switched to BasePF (i.e. #SysPFCtrl PtM = BASEPF). **INTERNAL** The required power factor is adjusted by the setpoint #SysPwrFactor. **EXTERNAL** The baseload is adjusted by the logical (functional) analog input MPF:AnExSysBPF. **Note:** If the external source is selected the logical analog input must be configured at each generator set to the identical source. See the note at the setpoint SysBaseLdMode.
Derating1 strt	-40 – 300° F	5	**500REZK, 750REZK, 1000REZK** = 86° F **400REZCK, 600REZCK, 800REZCK, 1000REZCK** = 77° F **1300REZCK** = 25°C		This setpoint is used for adjusting the starting point of the Power derating 1 function, where the generator set nominal power is still 100% of the setpoint Nomin power. Power derating 1 is based on ambient air temp.
Derating1 end	-40 – 300° F	5	**500REZK, 750REZK, 1000REZK** = 300° F **400REZCK, 600REZCK, 800REZCK, 1000REZCK** = 293° F **1300REZCK** = 145°C		This setpoint is used for adjusting the end point of the Power derating 1 function, where the generator set nominal power is reduced to the value adjusted by setpoint Derated1 pwr.
Derating1 pwr	0 – 100	5	76		This setpoint is used for adjusting the final power level for the Power derating 1 function. The nominal power is not reduced below this setpoint even if the respective analog input increases further.
Derating2 strt	-32000 – 32000	5	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK , 1000REZK** = 197.6° F **1300REZCK** = 92°C		This setpoint is used for adjusting the starting point of the Power derating 2 function, where the generator set nominal power is still 100% of the setpoint Nomin power.
Derating2 end	-32000 – 32000	5	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK , 1000REZK** = 203.0° F **1300REZCK** = 95°C		This setpoint is used for adjusting the end point of the Power derating 2 function, where the generator set nominal power is reduced to the value adjusted by setpoint Derated2 pwr.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Derating2 pwr	0 – 100%	5	20 For ESP and PRP?		This setpoint is used for adjusting the final power level for the Power derating 2 function. The nominal power is not reduced below this setpoint even if the respective analog input increases further.
Synchro enable	0 – NONE 1 – FORWARD	5	FORWARD		The setpoint is used for enable/disable forward and reverse synchronization. ● NONE: No synchronizing is enabled. ● FORWARD: GCB synchronizing is enabled. ● REVERSE: MCB synchronizing is enabled. ● BOTH: GCB and MCB synchronizing are enabled. **Note:** Although synchronizing of the particular breaker is disabled the breaker can be closed to a ”dead” (voltage-free) bus. **Note:** See table with examples in the description of the setpoint MFStart enable.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#Neutral cont	0 – EACH 1 – COMMON	5	EACH		The setpoint is used for adjusting the behavior of the Neutral CB C/O output according to actual site wiring. The neutral contactor is used to connect the neutral wire (N) with the protective wire (PE) in a TN–S system. This connection must exist in one moment at one point of the circuit only. The EACH option should be used if each generator set has it's own neutral contactor. Four-pole GCB must be used for this case. ● The output is always opened while the generator set is not running. ● The output is always opened while the MCB is closed. ● While the generator set is running and GCB is open, the output closes when generator voltage in at least one phase exceeds 85% of the nominal voltage. It opens when the generator voltage in all phases drops below 50% of the nominal voltage. ● While the generator set is running, MCB is open and GCB is closed, then the position of the output is given by an internal algorithm, which ensures, that always exactly one generator set connected to the bus has the neutral contactor closed. **Note:** Functional CAN2 communication between the controllers is required for this function. The COMMON option should be used if there is one common neutral contactor for the whole site. The outputs Neutral CB C/O from all controllers are combined together and the combined signal is used to control the breaker. Three-pole GCB must be used for this case. ● The output is always opened while the generator set is not running. ● The output is always opened while the MCB is closed. ● While the generator set is running the output closes when generator voltage in at least one phase exceeds 85% of the nominal voltage. It opens when the generator voltage in all phases drops below 50% of the nominal voltage. That means if at least one generator set in the site is running and having proper voltage, the neutral breaker is closed. **Note:** If there are more logical groups the "common" option is related to the group. That means one common neutral contactor is expected for each group. **Note:** As there is always a connection between the N and PE wires at the mains side the generator neutral contactors are always open when the mains breaker is closed.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
WatchedContr	OFF; 1	4	OFF		This setpoint is used at redundant controller to specify the address of the related main controller in CAN-based redundant systems. Adjust this setpoint to 0 if the controller is not used as redundant or if wired redundancy system is used.
Prallel Fnc	0 – DISABLED 1 – ENABLED	4	DISABLED		This setpoint indicates inclusion of a motorized circuit breaker for connecting or disconnecting the generator set on the paralleling bus.

SUS Control (Startup Synchronization Not Applicable)

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
SUS sequence		7	DISABLED		Not Applicable
RPM window	0 - 100%	7	5		Not Applicable
RPM win TO	0 - 6000 s	7	20		Not Applicable
#ExcitationDel	0 - 600 s; NO TIMEOUT	7	10		Not Applicable
#SUS min power	1 - 65000 kW	7	1001		Not Applicable
ExcitationCtrl		7	INTERNAL		Not Applicable

Basic Settings

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Nomin power	1 - 32000 kW	4	See the ratings chart.		This setpoint is used for adjusting the generator set nominal (rated) power, i.e. the maximum allowed generator set power level. Decision-Maker® 8000 controllers provide two independent power derating functions, which can be used for derating of the generator set according to an analog value (e.g. temperature). See the setpoints Derating1 strt and Derating2 strt. The nominal power or derated nominal power is used as the basis (100%) for gensetpower protections, as the upper limit of the requested power in the parallel-to-mains operation, for power management and other functions. **Note:** The actual setpoint units and range depend on setting of the Power format in GenConfig.
Nomin current	1 - 10000 A	6	See the ratings chart.		This setpoint is used for adjusting the generator nominal current. The nominal current is used as the basis (100%) for generator thermal overcurrent protection (2Inom del), and for short current protection (Ishort).
CT ratio prim	1 - 15000 A	3	See the ratings chart.		Nominal current of the primary side of the generator current transformers. The secondary side is adjusted by setpoint CT ratio sec. **Note:** The setpoints CT ratio prim and CT ratio sec must be adjusted properly to obtain correct generator current readings. **IMPORTANT!** The maximum measurable input current to the controller current terminals is 11A. **Warning!** Do not disconnect the CT terminals from the controller while there is nonzero current in the CT primary circuit!
CT ratio sec	0 – /5A 1 – /1A	5	/5A		Nominal current of the secondary side of the generator current transformers. The primary side is adjusted by setpoint CT ratio prim.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
EarthFltCurCTp	1 - 15000 A	7	300		Nominal current of the primary side of the current transformer connected to the controller terminals labeled IN. The secondary side is adjusted by setpoint EarthFltCurCTs. **Note:** The IN terminals are used for measurement of earth fault current.
EarthFltCurCTs	0 – /5A 1 – 1A	7	/5A		Nominal current of the secondary side of the current transformer connected to the controller terminals labeled IN. The primary side is adjusted by setpoint Im3/ErFlCurCTp. **Note:** The IN terminals can be used either for measurement of earth current or mains current (mains import). See also the setpoint I/E-Pm meas.
VT ratio	0.1 - 500 V/V	3	1		The setpoint is used to adjust the generator voltage transformers ratio. **Note:** Adjust the setpoint to the value of 1.0 if the generator voltage is connected directly to the controller terminals, i.e. without transformers. **Note:** Example: if you have transformers with ratio 4800/120V adjust the setpoint to the value of 40.0. **Note:** The range of the generator voltage inputs must be adjusted properly. See the setpoint Vg InpRangeSel.
Vg InpRangeSel	0 – 277V 1 – 120V	5	277 V		This setpoint selects the range of the generator voltage terminals. **Note:** The 277 V range is suitable for both European (230 V) and American (277 V) measurement. The range 120 V is intended for high-voltage applications where voltage transformers with 120 V secondary are used.
Vb VT ratio	0.1 - 500 V/V	5	1		The setpoint is used to adjust the bus voltage transformers ratio.
Vb InpRangeSel	0 – 277V 1 – 120V	5	277 V		This setpoint selects the range of the bus voltage terminals.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
GenNomV	10 - 34641 V	5	Refer to the specifications for the facility, the managing personnel for the facility, or measure the bus voltage.		This setpoint is used to adjust the nominal (rated) generator voltage (phase to neutral). If you do not know the phase-neutral nominal voltage, you can adjust the phase-phase nominal voltage GenNomVph-ph. The controller will then recalculate the phase-neut ral nominal voltage automatically. **Note:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **Note:** If different voltage on generator set and on Bus/Mains is required the following procedure is required: Both setpoints (BusNomV and GenNomV) must be adjusted to the same values according to the value of actual generator nominal voltage. For example, generator set nominal is 231 V but Bus/Mains nominal is 240 V. In this case both setpoints need to be adjusted to 231 V and setpoints of corresponding protections for Bus/Mains need to be set asymmetrically. For 240 V on Bus/Mains it is typical to open MCB when voltage reaches 254 V or 225 V. Since the setpoint is adjusted to 231 V corresponding protection setpoints need to be adjusted to Mains >V MP = 106% and Mains <V MP = 97 % (hence the desired values are reached).
GenNomVph-ph	17 - 60000 V	5	480		This setpoint is used to adjust the nominal (rated) generator voltage (phase to phase). This setpoint is also recalculated automatically when the phase-neutral nominal voltage GenNomV is changed. This setpoint can be used if you know the phase-phase nominal voltage only. The controller will recalculate the phase-neutral nominal voltage automatically when this setpoint is changed. **Note:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **Note:** If different voltage on generator set and on Bus/Mains is required the following procedure is required: Both setpoints (GenNomVph-ph and BusNomVph-ph) must be adjusted to the same values according to the value of actual generator nominal voltage. For example, generator set nominal is 400 V but Bus/Mains nominal is 415 V. In this case both setpoints need to be adjusted to 400 V and setpoints of corresponding protections for Bus/Mains need to be set asymmetrically. For 415 V on Bus/Mains it is typical to open MCB when voltage reaches 440 V or 390 V. Since the setpoint is adjusted to 400 V corresponding protection setpoints need to be adjusted to Mains >V MP = 106% and Mains <V MP = 97 % (hence the desired values are reached).

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
BusNomV	10 - 34641 V	5	Refer to the specifications for the facility, the managing personnel for the facility, or measure the bus voltage.		This setpoint is used to adjust the nominal bus voltage (phase to neutral). If you do not know the phase-neutral nominal voltage, you can adjust the phase-phase nominal voltage BusNomVph-ph. The controller will then recalculate the phase neutral nominal voltage automatically. **Note:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **Note:** If different voltage on generator set and on Bus/Mains is required the following procedure is required: Both setpoints (BusNomV and GenNomV) must be adjusted to the same values according to the value of actual generator nominal voltage. For example, generator set nominal is 231 V but Bus/Mains nominal is 240 V. In this case both setpoints need to be adjusted to 231 V and setpoints of corresponding protections for Bus/Mains need to be set asymmetrically. For 240 V on Bus/Mains it is typical to open MCB when voltage reaches 254 V or 225 V. Since the setpoint is adjusted to 231 V corresponding protection setpoints need to be adjusted to Mains >V MP = 106% and Mains <V MP = 97 % (hence the desired values are reached).
BusNomVph-ph	17 - 60000 V	5	480		This setpoint is used to adjust the nominal bus voltage (phase to phase). This setpoint is also recalculated automatically when the phase-neutral nominal voltage BusNomV is changed. This setpoint can be used if you know the phase-phase nominal voltage only. The controller will recalculate the phase-neutral nominal voltage automatically when this setpoint is changed. **Note:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **Note:** If different voltage on the generator set and on Bus/Mains is required the following procedure is required: Both setpoints (GenNomVph-ph and BusNomVph-ph) must be adjusted to the same values according to the value of actual generator nominal voltage. E.g. generator set nominal is 400 V but Bus/Mains nominal is 415 V. In this case both setpoints need to be adjusted to 400 V and setpoints of corresponding protections for Bus/Mains need to be set asymmetrically. For 415 V on Bus/Mains it is typical to open MCB when voltage reaches 440 V or 390 V. Since the setpoint is adjusted to 400 V corresponding protection setpoints need to be adjusted to Mains >V MP = 106% and Mains <V MP = 97 % (hence the desired values are reached).

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
FixVoltProtSel	0 - PHASE - NEUTRAL 1 - PHASE - PHASE	7	PHASE-PHASE		PHASE-NEUTRAL: The generator and mains/bus voltage protections are based on phase-neutral voltages and the phase-neutral nominal voltages are taken as 100%. PHASE-PHASE: The generator and mains/bus voltage protections are based on phase-phase voltages and the phase-phase nominal voltages are taken as 100%. **Note:** Both options require different settings of protection levels to achieve identical results. **Example:** Phase-nominal voltage is 231V, actual voltages are L1N = 231V, L2N = 231V, L3N = 219.5V => the L3N voltage is at 95% of the nominal. The same situation evaluated from phase-phase voltages gives following results: nominal phasephase voltage is 400V, measured voltages are L12 = 400V, L23 = 390V, L31 = 390V => the L23 and L31 are at 97.5% of the nominal. It is obvious that if the situation is evaluated from phase-neutral voltages the tripping level must be adjusted to 95%, whereas the same situation evaluated from phase-phase voltages require tripping level adjusted to 97.5%.
Nominal freq	0 - 50 Hz 1 - 60.Hz	7	60 Hz		The setpoint adjusts nominal system frequency (choose 50 Hz or 60 Hz). Setpoint Nom frq offset is used for setting offset to the chosen nominal frequency (-2 to +2 Hz with step 0.01 Hz). Controller regulates to the Nominal Freq + Nom frq offset frequency. The value Nominal Freq + Nom frq offset is used as 100% for generator and mains/bus frequency protections and as requested value for frequency regulation (except synchronizing) if the setpoint Freq reg loop is set to ALL THE TIME.
Nom frq offset	-2-2 Hz	7	0		The setpoint adjusts offset of nominal system frequency (Nominal Freq) with step 0.01 Hz. Controller regulates to the Nominal Freq + Nom frq offset frequency. The value Nominal Freq + Nom frq offset is used as 100% for generator and mains/bus frequency protections and as requested value for frequency regulation (except synchronizing) if the setpoint Freq reg loop is set to ALL THE TIME.
Gear teeth	FGen->RPM; 1 - 500	7	FGen->RPM		Number of teeth on the engine's flywheel for the pick-up sensor. Engine speed is derived from the engine speed and fuel control system via CAN communications. If speed values are not received, the engine speed will be calculated from the frequency of the electrical output from the alternator.
Nominal RPM	100 - 4000 RPM	7	1800		The setpoint adjusts the nominal generator set speed. The nominal speed is used: • As 100% for the overspeed protection (setpoint Overspeed) • For current speed calculation if it is calculated from generator frequency. See the setpoint Gear teeth. **Note:** The setpoints Nominal RPM and system frequency (Nominal Freq + Nom frq offset) must correspond to each other; therefore, if the engine speed is at nominal value then the generator frequency must be at nominal value as well.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
ControllerMode	0 - OFF 1 - MAN 2 - AUT	1	OFF		This setpoint can be used to select the controller mode. It is equivalent to selecting the mode by the buttons on the front panel. Currently active mode is displayed on the controller main screen. **Note:** If any of the mode forcing inputs Remote OFF, Remote MAN, Remote AUT or Remote TEST is active, then the currently active mode can be different than the mode selected by the setpoint (resp. panel buttons). **OFF:** The GCB is opened and the engine is immediately stopped in this mode without unloading and cooling. After that the controller is in Not ready state and can not be started any way. The MCB is closed permanently (MCB Opens On = GENRUN) or is open or closed according to the mains is present or not (MCB Opens On = MAINSFAIL). **MAN:** The engine can be started and stopped manually using START and STOP buttons (or external buttons wired to appropriate binary inputs) in MAN mode. When the engine is running, GCB can be closed to a dead bus or synchronizing can be started by the GCB button. Also MCB can be closed and opened manually using the MCB button, regardless the mains is present or not. No autostart is performed. No reaction to the inputs Sys Start/Stop or Rem Start/Stop. **AUT:** This is fully automatic operation. The engine is started and stopped by: • Binary input Rem Start/Stop • Power management Buttons GCB, START, STOP including the appropriate binary inputs for external buttons are not active. The full start sequence up to the moment when the engine is loaded is automatic as well as unloading and stop sequence. **Important!** If a red alarm is present and the generator set is in AUT mode, it can start by itself after all red alarms becomes inactive and are acknowledged!!! If you want to avoid this situation, adjust the setpoint FltRes GoToMAN to the ENABLED position.
FltRes GoToMAN	0 - DISABLED 1 - ENABLED	1	ENABLED		This setpoint can be used to avoid possible unexpected automatic start of the generator set in AUT mode after the generator set was stopped by a protection and then fault reset was pressed. **ENABLED:** The controller mode is automatically changed from any mode except OFF to MAN if any red-level protection is acknowledged by pressing of the fault reset. **DISABLED:** The automatic change of the controller mode is disabled. **Note:** The function will not work if the current controller mode is forced by one of the inputs Remote AUT or Remote TEST.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Local buttons	0 – PANEL 1 – EXTBUTTONS 2 – BOTH	1	BOTH		The setpoint selects which set of control buttons is currently active. Its function depends on which type of controller is used. Please refer to the section which suits your controller/display version. **Note:** If you use additional IV display, all the sections may be relevant (depending on the type of additional displays). Situation is depicted in the following figure. • Start, Stop, and Horn Reset are inactive when EXTBUTTONS option is selected and active when PANEL or BOTH option is selected. • Navigation, hot keys, and context sensitive buttons are active when any option is selected. • Behavior of GCB Open/Close, Fault Reset, and Controller Mode buttons depends on functions assigned to each button individually. If any function in the list in the note below is assigned to these buttons then it behaves as navigation, hot keys, or context sensitive buttons, if any other function is assigned to these buttons it behaves as the Start, Stop, and Horn Reset buttons. • For binary inputs for external buttons, the built–in buttons are disabled and the binary inputs for external buttons are enabled. **Note:** In the case that more IV displays are connected, they all behave the same (they are all clones of each other). **Note:** The binary inputs for external buttons may be the following (depending on used application): GCBButton, MCBButton, MGCBButton, FDRButton, BTBButton, FaultResButton, HornResButton, StartButton, StopButton etc.
DispBaklightTO	OFF; 1 - 240 min.; NO TIMEOUT	1	NO TIMEOUT		This setpoint adjusts timeout after which the display (internal display or IS display #1) backlight is switched off. **Note:** This setpoint does not adjust its behavior. Its backlight is adjusted by an internal ”setpoint”. **OFF** The backlight is off all the time **NO TIMEOUT** The backlight is on all the time
DispBklStrtOff		1	DISABLED		If this setpoint is in ENABLED position the display backlight is temporarily switched off during generator set start.
UserBtn pulse	0.2 - 10 s	1	0.2		This setpoint adjusts the duration of User Button 1..16 pulse.
ConvCoefPulse1	1 - 65000 /X	7	1		This setpoint adjusts the rate of increasing of the PulseCounter #1 module. The module counts pulses at the input PulseCounter 1 and if the input pulses counter reaches value given by this setpoint, the counter value PulseCounter 1 (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.
ConvCoefPulse2	1 - 65000 /X	7	1		This setpoint adjusts the rate of increasing of the PulseCounter #2 module. The module counts pulses at the input PulseCounter 2 and if the input pulses counter reaches value given by this setpoint, the counter value PulseCounter 2 (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
ConvCoefPulse3	1 - 65000 /X	7	1		This setpoint adjusts the rate of increasing of the PulseCounter #3 module. The module counts pulses at the input PulseCounter 3 and if the input pulses counter reaches value given by this setpoint, the counter value PulseCounter 3 (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.
ConvCoefPulse4	1 - 65000 /X	7	1		This setpoint adjusts the rate of increasing of the PulseCounter #4 module. The module counts pulses at the input PulseCounter 4 and if the input pulses counter reaches value given by this setpoint, the counter value PulseCounter 4 (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.

Communication Settings

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Gen-set name		1	KohlerPowerSys		This setpoint is intended for a custom name of the generator set, which is used for identification of the generator set in saved archives or remote connections. Maximum length of the name is 15 characters
Contr. address	1-32	1	1		This setpoint adjusts the address of the particular controller at the CAN2 and/or RS485 bus. Each generator set connected to the same bus must have unique address. If the setpoint CANnegotiation (COMBI application only) is in AUT position, the address is assigned automatically. The setpoint Contr. addr is preferred then, however if it is in conflict with other controller present on the CAN2 bus other address will be assigned to avoid address collision. **Note:** Address 1 is recommended for standalone generator sets. **Note:** If you are connecting to the generator set remotely you have to adjust the proper controller address in connection settings of the remote client (InteliMonitor, GenConfig, Modbus client etc.) **Note:** Address of the controller is also used for Modbus communication via RS485 etc. Address adjusted by this setpoint is therefore universal address of the controller.
RS232(1) mode	0 - DIRECT 1 - MODEM (HW) 2 - MODEM (SW) 3-MODBUS-DIRECT 4 - MODBUS-MDM (HW) 5 - ECU LINK	1	DIRECT		This setpoint selects the connection type for the serial port COM1 • Available as RS232 in all controller types. **DIRECT**: Connection to a local PC via RS232 or RS485 (with internal or external converter) interface. **MODEM (HW):** Modem point-to-point connection to a remote PC with hardware data flow control using signals RTS/CTS. Full modem cable is required for this option. **MODEM (SW):** Modem point-to-point connection to a remote PC with software data flow control. 3-wire cable (RX, TX, GND) is sufficient for this option. Use this option only if your modem does not provide RTS/CTS signals. **MODBUS:** Modbus RTU connection in slave mode via RS232 or RS485 (with internal or external converter) interface. The internal RS485 converter is enabled/disabled by the setpoint RS485(1) conv., the communication speed is adjustable by the setpoint RS232(1)MBCSpd. See the latest communication guide for more information about MODBUS protocol. **MODBUS-MDM(HW):** Modbus RTU connection in slave mode via modem with hardware data flow control. The communication speed is adjustable by the setpoint RS232(1)MBCSpd. See the latest communication guide for more information about MODBUS protocol. **ECU-LINK**: Connection to an electronic-controlled engine which uses non-J1939 ECU. The proper ECU type must be also configured with GenConfig.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
RS232(2) mode	0 - DIRECT 1 - MODEM (HW) 2 - MODEM (SW) 3 - MODBUS-DIRECT 4 - MODBUS-MDM (HW) 5 - ECU LINK	1	DIRECT		This setpoint selects the connection type for the serial port COM2. • Available only as RS485. **DIRECT:**Connection to a local PC via RS232 or RS485 (with internal or external converter) interface. **MODEM (HW):** Modem point-to-point connection to a remote PC with hardware data flow control using signals RTS/CTS. Full modem cable is required for this option. **MODEM (SW):** Modem point-to-point connection to a remote PC with software data flow control. 3-wire cable (RX, TX, GND) is sufficient for this option. Use this option only if your modem does not provide RTS/CTS signals. **MODBUS:** Modbus RTU connection in slave mode via RS232 or RS485 (with internal or external converter) interface. The internal RS485 converter is enabled/disabled by the setpoint RS485(2) conv., the communication speed is adjustable by the setpoint RS232(2)MBCSpd. **MODBUS-MDM(HW):** Modbus RTU connection in slave mode via modem with hardware data flow control. The communication speed is adjustable by the setpoint RS232(2)MBCSpd. **ECU-LINK:** Connection to an electronic-controlled engine which uses non-J1939 ECU. The proper ECU type must be also configured with GenConfig **Note:** The RS232 connector is no more available in hardware version 2.0 and above. The COM2 port is redirected to the RS485(2) terminals all the time. That means modem is not supported at COM2 in these hardware versions. For modem use the COM1 port instead.
RS232(1)MBCSpd	0 - 9600 1 - 19200 2 - 38400 3 - 57600	1	9600		The setpoint adjusts the communication speed on the COM1 connector when it is switched to MODBUS or MODBUS-MDM(HW) mode. See also the setpoint RS232(1) mode.
RS232(2)MBCSpd	0 - 9600 1 - 19200 2 - 38400 3 - 57600	1	9600		The setpoint adjusts the communication speed on the COM2 connector when it is switched to MODBUS or MODBUS-MDM(HW) mode. See also the setpoint RS232(2) mode.
RS232(1)MdmIni		1			This setpoint can be used to add extra AT commands at the end of the initialization sequence of the modem connected to the COM1 port. The command can be entered with as well as without the "AT" prefix, are separated with semicolon and maximal length is 31 characters.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
RS485(2)conv.	0 - DISABLED 1 - ENABLED	1	ENABLED		This setpoint selects function of the built-in RS485(2) converter. **ENABLED:** The communication port COM2 is redirected to the integrated RS485(2) converter. The RS232(2) connector has no function. **DISABLED**: The communication port COM2 is present at the RS232(2) connector. **Note:** The redirection is applied only for DIRECT, MODBUS and ECU-LINK modes. See the setpoint RS232(2) mode. **Note:** This setpoint has no function for Decision-Maker® 8000 as this controller modifications do not provide the RS232 connector at the COM2 port. The port is redirected to the RS485 interface all the time regardless of this setpoint.
CAN bus mode	0 - 32C 1 - 8C	1	32C		CAN bus speed selection. ● 32C: High speed CAN (250 kbps) applicable up to 32 controllers, CAN bus length limited up to 200 m (656 ft.). ● 8C: Low speed CAN (50 kbps) applicable up to 8 controllers, CAN bus length limited up to 900 m (2953 ft.). Change of this setpoint is applied after the controller is switched off and on again. **Note:** Use low speed for long distance connection only. Set all connected controllers to the same speed.
CAN2emptDetect	0 - DISABLED 1 - ENABLED	1	DISABLED		Enables the detection of missing other controllers on the CAN2 bus. If the setpoint is in ENABLED position and there aren't any other controllers detected on the CAN2 bus (the complete bus, not only within the logical group) the alarm CAN2Empty is issued. **Note:** When paralleling multiple generator sets, change this setpoint to ***ENABLED***.
LB/UART Log	0 - DISABLED 1 - ENABLED	1	DISABLED		The setpoint enables/disables logging of remote communication activity. If logging is enabled connection and disconnection of each remote terminal as well as entering access code are recorded into the history **Note:** The terminal is disconnected automatically after 5 min of inactivity and next communication request from the same terminal is considered as a new connection. When logging is enabled in certain conditions the history may be filled up with large number of records related to the communication and important records may be overwritten quite quickly.
CANAddrSwitch1	0 - MODEM 1 - OTHER	1	OTHER		The setpoint selects function of the terminal address 122 at the CAN2 line. See the latest communication guide for details about this topic. **MODEM:** The address is used for modem connection via I-LB **OTHER:** The address is used for direct connection to any other device as e.g. IV8 or I-RD.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
CANAddrSwitch2	0 - MODEM 1 - OTHER	1	OTHER		The setpoint selects function of the terminal address 125 at the CAN2 line. See the latest communication guide for details about this topic. **MODEM:** The address is used for modem connection via I-LB **OTHER:** The address is used for direct connection to any other device as e.g. IV8 or I-RD
IP addr mode	0 - FIXED 1 - AUTOMATIC	1	AUTOMATIC		The setpoint is used to select the method how the Ethernet connection is adjusted. **FIXED:** The Ethernet connection is adjusted fixedly according to the setpoints IP address, Net mask, Gateway IP, DNS IP. . This method should be used for classic Ethernet or Internet connection. When this type of connection is opening the controller is specified by it's IP address. That means it would be inconvenient if the IP address were not fixed (static). **AUTOMATIC:** The Ethernet connection settings is obtained automatically from the DHCP server. The obtained settings is then copied to the related setpoints (it is not possible to set those setpoints manually in this setting, for more information please see the following setpoints: IP address, Net mask, Gateway IP and DNS IP). If the process of obtaining the settings from DHCP server is not successful the value 000.000.000.000 is copied to the setpoint IP address and the module continues trying to obtain the settings. This method is beneficial for AirGate connection as it makes the connection very easy, in fact "plug and play". When this type of connection is opening the controller is specified by it's AirGate ID and the IP address does not play any role **IMPORTANT!** If you need to use fixed Ethernet settings you should consult the proper setting with your IT specialist
IP address	0.0.0.0	1	0.0.0.0		• In fixed settings mode this setpoint is used to adjust the IP address of the Ethernet interface of the controller. Ask your IT specialist for help with this setting. • In Automatic settings mode this setpoint is used to display the IP address, which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting (the value is immediately reverted back by controller communication module IB-COM).
Net mask	0.0.0.0	1	0.0.0.0		• In fixed settings mode this setpoint is used to adjust the network mask of the network segment where the controller is connected. • In Automatic settings mode this setpoint is used to display the network mask which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting (the value is immediately reverted back by controller communication module IB-COM).

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Gateway IP	0.0.0.0	1	0.0.0.0		• In fixed settings mode this setpoint is used to adjust the IP address of the gateway of the network segment where the controller is connected. • In Automatic settings mode this setpoint is used to display the gateway IP address which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting. A gateway is a device which connects the respective segment with the other segments and/or Internet.
ComApProtoPort	0 - 65535	1	23		This setpoint is used to adjust the port, which is used for Ethernet connection to a PC with InteliMonitor. This setpoint should be adjusted to 23, which is the default port used by all ComAp PC programs. A different value should be used only in special situations as e.g. sharing one public IP address among many controllers or to overcome a firewall restrictions.
AirGate	0 – DISABLED 1 – ENABLE D	1	ENABLED		This setpoint selects the Ethernet connection mode. **DISABLED** This is a standard mode, in which the controller listens to the incoming traffic and answers the TCP/IP queries addressed to him. This mode requires the controller to be accessible from the remote device (PC), i.e. it must be accessible at a public and static IP address if you want to connect to it from the Internet. **ENABLED** This mode uses the *AirGate* service, which hides all the issues with static/public address into a black box and you do not need to take care about it. You just need only a connection to the Internet. The AirGate server address is adjusted by the setpoint AirGate addr.
AirGate IP		1			This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at address airgate.comap.cz if your company does not operate it's own AirGate server.
SMTP authent	0 – DISABLED 1 – ENABLED	1	DISABLED		Switch this setpoint to ENABLED position if your SMTP server requires authenticated access. You have also adjust SMTP user name and SMTP password. Ask your Internet provider or IT manager for this information. **Note:** Most of public free SMTP servers require authentication. You will get instructions when you register to the freemail service.
SMTP user name		1			Use this setpoint to enter the user name for the SMTP server if SMTP authentication is enabled.
SMTP password		1			Use this setpoint to enter the password for the SMTP server if SMTP authentication is enabled.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
SMTP address		1			**IMPORTANT!** Proper setting of SMTP-related setpoints as well as controller mailbox are essential for sending alerts via e-mails. This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) of the SMTP server. Please ask your Internet provider or IT manager for this information. **Note:** You may also use one of free SMTP servers, e.g. smtp.gmail.com. However, please note that some free SMTP servers may cause delays (in hours..) when sending e-mails. **Note:** If you do not want to send active e-mails, you may leave this setpoint blank, as well as other setpoints related to SMTP server and e-mail settings.
Contr mailbox		1			Enter an existing e-mail address into this setpoint. This address will be used as sender address in active e-mails that will be sent from the controller. Do not enter your or other recipient's e-mail address. Recipient's addresses are to be entered into the setpoints AcallCH1-Addr, AcallCH2-Addr and AcallCH3-Addr. **Note:** Most of SMTP server will reject sending e-mails that contain non-existing address in the sender address field.
Time zone	0 - GMT - 12:00 1 - GMT - 11:00 2 - GMT - 10:00 3 - GMT - 9:00 4 - GMT - 8:00 5 - GMT - 7:00 6 - GMT - 6:00 7 - GMT - 5:00 8 - GMT - 4:00 9 - GMT - 3:30	1	GMT+1:00		This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the windows task bar) if you are not sure about your time zone. **Note:** If the time zone is not selected properly the active e-mails may contain incorrect information about sending time, which may result in confusion when the respective problem actually occurred.
DNS IP	0.0.0.0	1	0.0.0.0		• In fixed settings mode this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in e-mail addresses and server names into correct IP addresses. • In Automatic settings mode this setpoint is used to display DNS server, which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
ECU Diag	0 - DISABLED 1 - ENABLED	1	ENABLED		This setpoint is used to disable reading of diagnostic codes from the ECU if an external diagnostic tool is connected to the engine. A message ECU Diag disabled is displayed in the alarm list while ECU diagnostics is disabled.
SHxOcol Detect	0 - DISABLED 1 - ENABLED	1	ENABLED		This setpoint is used to enable/disable evaluation of collisions of virtual shared peripherial modules. A collision means that there is more than one source (shared outputs module) active on the CAN2 bus. **Note:** In certain situations multiple sites with bus tie breakers may need to have more shared outputs sources as the CAN bus line is in some points interrupted according to bus tie breakers position. Normally a collision would be indicated if there were more sources on the bus and this setpoint can be used to disable the evaluation of collisions in this special case.

Engine Parameters

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Starting RPM	0 - 1500 RPM	7	300		This setpoint adjusts ”firing” speed level. When this level is reached during cranking, the engine is considered as started and the starter motor is disengaged, i.e. the output Starter is deactivated. **Note:** There are also other symptoms that causes disengagement of the starter.
Underspeed	3–3000	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 50 **1300REZCK** = 150		This setpoint is used as the minimum speed threshold for the Underspeed protection, which is activated 5s after the starter was disengaged and the controller continued from Starting to Idle or Running phase. If the engine speed drops below this setpoint, the controller issues an underspeed alarm and the generator set shuts down. **Note:** Force value 4 temporarily lowers the normal crank disconnect speed by 50 RPMs after the starter is disengaged to prevent unnecessary underspeed warnings or shutdowns.
Starting POil	0 - 10 Bar	7	10		Oil pressure can be used as one of the symptoms that are used for detection that the engine is running. This setpoint adjusts oil pressure limit above which the engine is considered as started. **Note:** The logical analog input Oil pressure must be configured onto the appropriate analog input where the oil pressure sensor is connected.
Prestart time	0 - 3600 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 300 **1300REZCK** = 0		This setpoint adjust length of the prestart period before starter is engaged. The output Prestart is active during the prestart period. The prelubrication pump energizes during the prestart period. **Note:** Force value 1, 2, and 3 are used to reduce Prestart Time when the **Start** button is pressed in MAN mode based on oil temperature.
PrelubrTime	0 - 3600 s	7	0		This setpoint is used for adjusting duration of the prelubrication cycle. See the output Prelubr pump for details about prelubrication.
PrelubrPause	1 – 3000 min.	7	1		This setpoint is used for adjusting the pause between two consequent prelubrication cycles. See the output Prelubr pump for details about prelubrication.
MaxCrank time	1 - 240 s	7	15		The setpoint adjusts the maximum duration the starter motor is energized within one cranking cycle. If there is none of running engine symptoms activated within this period the particular cranking attempt is finished and either a cranking pause follows or start fail alarm is issued. **Note:** The last cranking cycle is extended about 25% and the engine is cranked with closed gas valve during this additional time to ventilate the remaining gas. **Note:** If magnetic pickup is used and the controller does not detect non–zero RPM within 2s after energizing the starter motor then cranking pause follows immediately (as the pinion is probably not properly engaged). **Note:** Force value 5 is used to extend the crank time after three failed crank attempts.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
CrnkFail pause	5 - 60 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 30 **1300REZCK** = 60		The setpoint adjusts the pause between two subsequent cranking cycles. **Note:** Force value 6 is used to extend the pause time after three failed crank attempts.
Crank attempts	1 - 10	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 6 **1300REZCK** = 10		The setpoint adjusts the maximum number of cranking cycles. The alarm Start fail is issued when the engine does not start within this number of cranking cycles. **Note:** The last cranking cycle is extended about 25% and the engine is cranked with closed gas valve during this additional time to ventilate the remaining gas.
Idle time	0-3600 s	7	0		This setpoint adjusts duration of the idle period, which begins in the moment when the engine is started (e.g. the starter motor is disengaged). The output Idle/Nominal is not active to keep the engine at idle speed (if the governor supports idling) during idle period.
Min stab time	1-3600 s	5	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 10 **1300REZCK** = 5		This setpoint adjusts the minimum time between the end of the idle period and closing of the GCB. Closing of the GCB is blocked during this period even if generator voltage and frequency are in limits.
Max stab time	10-3600 s	5	3600		This setpoint adjusts the maximum time between the end of the idle period and reaching proper generator voltage and frequency. If the proper generator voltage and frequency is not reached within this period generator voltage and/or frequency alarm is issued and the generator set is stopped.
Warming load	0-100%	5	20		This setpoint is used to adjust the requested load level during warming period in % of the Nomin power. The warming period takes place after the generator set has been synchronized to the mains if the temperature measured at the logical analog input Warming Temp is below the value of Warming temp. The generator set load is maintained at Warming load, which should be adjusted to cca 20-30% of the nominal load to allow the engine reaching of it's operational temperature smoothly. The warming period is finished either when the temperature reaches the warming level or if duration of the warming period reaches Max warm time.
Warming temp	-3200-32000°C	5	0		This setpoint adjusts the warming temperature. The warming phase is finished when either the coolant temperature at the logical analog input Warming temp reaches this level or the Max warm time elapses. **Note:** See also the setpoint Warming load.
Max warm time	0-3600 s	5	10		This setpoint adjusts the maximum duration of the warming phase after the genset was synchronized to the mains. The warming phase is finished when either the coolant temperature at the logical analog input Warming Temp reaches this level or the Max warm time elapses.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Cooling speed	0 - IDLE 1 - NOMINAL	7	NOMINAL		This setpoint is used to select whether the cooling phase is performed at idle or nominal speed, i.e. whether the output Idle/Nominal is open or closed during the idle phase. **NOMINAL** Generator set performs cooling at nominal speed, generator voltage and frequency protections remain active during cooling phase. **IDLE** Generator set performs cooling at idle speed, generator protections are not active in the cooling phase (except of Gen >V Sd).
Cooling time	0-3600 s	2	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 300 **1300REZCK** = 60		This setpoint is used to adjust the length of the Cooling phase, which takes place after the generator set has been unloaded (GCB opened) and before it is stopped. The cooling phase can be performed either at nominal or at idle speed. See the setpoint Cooling speed. If the cooling phase length optimization is enabled, the actual length depend on the actual genset load in the moment the stop sequence was started. See the setpoint Cooldown optim.
CoolDnAfterBOC	0 - STOP 1 - INFIN COOLING	2	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = STOP **1300REZCK** = INFIN COOLING		The setpoint selects the controller behavior in cooling phase after a BOC alarm: **STOP** The controller behaves as usually, e.g. the cooling phase lasts for period adjusted by the setpoint Cooling time and then the generator set is stopped. **INFIN COOLING** The cooling phase is not finished automatically when the Cooling time elapses. The generator set remains in cooling until another event changes the it's state, e.g. it is manually stopped. If the generator set is in AUT mode and the alarm is not active and has been reset the generator set returns to loaded state automatically.
Cooldown optim	0 - DISABLED 1 - ENABLED	2	DISABLED		This setpoint enables optimization of the cooling phase length based on the previous generator set load. **DISABLED** The length of the cooling phase is given by the setpoint Cooling time regardless of the previous generator set load. **ENABLED** The length of the cooling phase is linearly reduced according to the generator set load in the moment the stop sequence started (i.e. prior to the generator set begun to ramp down or opened the GCB). If the load was 100% of the nominal power the length will be 100% of the setpoint Cooling time, if the load was 50% the length will be reduced to 50% etc...
AfterCoolTime	0-3600 s	7	120		The setpoint is used to adjust the length of the aftercooling period, i.e. how long the cooling pump remains running after the generator set has been stopped.
Stop time	0-240 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 60 **1300REZCK** = 0		This setpoint is used to adjust the time period the generator set needs to stop completely. If the generator set does not stop within this period the alarm Stop fail is issued.
SDVentil time	0-60 s	3	3		This setpoint is used to adjust the length of the preventilation phase at gas engines, The preventilation phase is a period of cranking without opened gas valve which takes place prior to the first start attempt after a shutdown or after switching on the controller. The purpose of the preventilation phase is to clean the engine and exhaust system from possible unburned gas.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Fuel solenoid	0 - DIESEL ENGINE 1 - GAS ENGINE	7	GAS ENGINE		This setpoint is used to select the type of starting sequence. The main difference in the behavior of the fuel Solenoid at diesel and gas engine is that at diesel engines the fuel solenoid is activated prior to the starter motor, whereas at gas engines it is not activated until the generator set reaches 30 RPM.
FuelSol offset	-5-5 s	5	2		This setpoint is used for fine adjustment of the moment when the Fuel Solenoid output is activated. The time is related to the activation of the Starter output, where negative values mean the fuel solenoid is activated in advance to the starter motor and positive values mean the fuel solenoid is delayed after the starter motor.
D+ function	0 - DISABLED 1 - CHARGFAIL 2 - ENABLED	7	DISABLED		Only applicable on units with an battery-charging alternator. This setpoint adjusts the function of the D+ terminal. **ENABLED** The D+ terminal is used for running engine detection as well as for charger failure alarm detection. **CHRGFAIL** The D+ terminal is used for charger failure alarm detection only. **DISABLED** The D+ terminal is not used. **Note:** Some alternators provide a terminal labelled as ”L” instead of ”D+”. It is not possible to connect this ”L” terminal to the ”D+” terminal of the controller.
Bin selector 1	0 - OFF 1 - ON	7	OFF		The setpoint is used to switch on and off the output Bin selector 1.
Bin selector 2	0 - OFF 1 - ON	7	OFF		The setpoint is used to switch on and off the output Bin selector 2
Bin selector 3	0 - OFF 1 - ON	7	OFF		The setpoint is used to switch on and off the output Bin selector 3.
Bin selector 4	0 - OFF 1 - ON	7	OFF		The setpoint is used to switch on and off the output Bin selector 4.
MaxFuelDrop	OFF; 1-50%	7	25		Not applicable on gaseous engines. This setpoint adjusts the maximal allowed drop of the fuel level within one hour. If measured drop is higher then Fuel theft alarm is issued. The setpoint should be adjusted according to the maximal hour fuel rate of the engine and capacity of the tank. **Note:** The logical analog input Fuel level must be configured onto the physical analog input where fuel level sensor is connected. **EXAMPLE:** A 100 kW engine has specific fuel rate of 180 g/kWh. Fuel tank capacity is 200l. The hour fuel rate at nominal power is then 100 * 180 = 18000 g per hour, what is about 21 liters (density cca 830 g/l => 18000/830 = 21). The maximal hour rate is then about 10% of the tank capacity, so optimal adjustment for this case will be 15% (with certain reserve).
LoadedLevel	0-100%	7	5		LoadLevel setpoint determines the point where the generator is considered to be loaded. When the output power is above this value, the Engine State will show as Loaded, in the middle of the Status screen on the front of the display module.

Engine Protections

Setpoint	Range Setting	Access Level	Default Settings	User-Defined Settings	Definitions
Horn timeout	OFF; 1-3600 s; NO TIMEOUT	1	NO TIMEOUT		This setpoint adjusts time after which the Horn output is automatically deactivated although the alarms still haven't been reset. If the setpoint is adjusted to OFF the horn output is not activated at all, the NO TIMEOUT position means the horn output is not deactivated until the alarms are reset.
RunOnlyBlkDel1	0-3000 s	7	1		This setpoint adjusts the delay after engine start when the alarms configured as RunOnlyBlkDel1 (i.e. *running only*, group #1) are started to be evaluated. The "running only" alarms are not being evaluated while the engine is not running or then, after start, while the adjusted delay is running.
RunOnlyBlkDel2	0-3000 s	7	5		This setpoint adjusts the delay after engine start when the alarms configured as RunOnlyBlkDel2 (i.e. *running only*, group #2) are started to be evaluated. The *running only* alarms are not being evaluated while the engine is not running or then, after start, while the adjusted delay is running. See the setpoint RunOnlyBlkDel1 for diagram of alarm groups and their blocking periods.
RunOnlyBlkDel3	0-3000 s	7	10		This setpoint adjusts the delay after engine start when the alarms configured as RunOnlyBlkDel3 (i.e. *running only*, group #3) are started to be evaluated. The *running only* alarms are not being evaluated while the engine is not running or then, after start, while the adjusted delay is running. See the setpoint RunOnlyBlkDel1 for diagram of alarm groups and their blockingperiods.
BinInp delay 1	0-600 s	7	1		This setpoint adjusts the delay #1 which can be assigned to an input configured as alarm input (protection). **Note:** Protections configured at a binary inputs can have either fixed 0.5 s evaluation delay or there are three independent delay setpoints and one of them can be assigned to each particular binary input protection.
BinInp delay 2	0-600 s	7	2		This setpoint adjusts the delay #2 which can be assigned to an input configured as alarm input (protection). **Note:** Protections configured at a binary inputs can have either fixed 0.5 s evaluation delay or there are three independent delay setpoints and one of them can be assigned to each particular binary input protection.
BinInp delay 3	0-600 s	7	5		This setpoint adjusts the delay #3 which can be assigned to an input configured as alarm input (protection). **Note:** Protections configured at a binary inputs can have either fixed 0.5 s evaluation delay or there are three independent delay setpoints and one of them can be assigned to each particular binary input protection.
ForceBlock1Del	0-60 s	7	10		This setpoint adjusts the delay after the binary input Force block 1 has been deactivated, when the alarms configured as Force block #1 are started to be evaluated.
ForceBlock2Del	0-60 s	7	20		This setpoint adjusts the delay after the binary input Force block 2 has been deactivated, when the alarms configured as Force block #2 are started to be evaluated.
ForceBlock3Del	0-60 s	7	5		This setpoint adjusts the delay after the binary input Force block 3 has been deactivated, when the alarms configured as Force block #3 are started to be evaluated.

Setpoint	Range Setting	Access Level	Default Settings	User-Defined Settings	Definitions
ResetActAlarms	0 - DISABLED 1 - ENABLED	7	ENABLED		**DISABLED** Pressing of the fault reset button (at any terminal or external button) resets only inactive alarms. Active alarms remain in the alarmlist unchanged and must be reset again when they become inactive. **ENABLED** Pressing of the fault reset button (at any terminal or external button) resets all alarms that are currently present in the alarm list. Inactive alarms disappear from the alarm list immediately, active alarms are changed to *confirmed* state and disappear when the alarm condition disappear or the alarm starts to be blocked.
Overspeed	0-200%	3	120		This setpoint adjusts the threshold level for overspeed protection. **Note:** The overspeed protection is evaluated all the time and without any delay.
Max+CylDifPmin	0-3000°F	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 30 **1300REZCK** = 10		This setpoint adjusts the maximum allowed positive difference between a particular cylinder temperature and average cylinder temperature at minimum power level adjusted by setpoint PminCylDifEval. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differences depending on generator set power. See the picture below. If the difference of actual cylinder temperature from the average temperature is out of the allowed range at one or more cylinders the alarm Wrn CylTemp is issued after the delay CylDifEvalDel elapses. The alarm is intended for detection that there is a problem with combustion at the particular cylinders. **Note:** Logical analog inputs Cyl temp *n* must be configured onto the appropriate physical analog inputs where the cylinder temperature sensors are connected. Use the *Cylinder temperature configuration wizard* in GenConfig - Analog inputs tab for easy configuration of cylinder temperature sensors.
Max-CylDifPmin	0-3000°F	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 30 **1300REZCK** = 10		This setpoint adjusts the maximum allowed negative difference between a particular cylinder temperature and average cylinder temperature at minimum power level adjusted by setpoint PminCylDifEval. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differences depending on generator set power. See the setpoint Max+CylDifPmin for more details.
Max+CylDifPnom	0-3000°F	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 30 **1300REZCK** = 10		This setpoint adjusts the maximum allowed positive difference between a particular cylinder temperature and average cylinder temperature at nominal power. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differences depending on generator set power. See the setpoint Max+CylDifPmin for more details.
Max-CylDifPnom	0-3000°F	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 30 **1300REZCK** = 10		This setpoint adjusts the maximum allowed negative difference between a particular cylinder temperature and average cylinder temperature at nominal power. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differences depending on generator set power. See the setpoint Max+CylDifPmin for more details.

Setpoint	Range Setting	Access Level	Default Settings	User-Defined Settings	Definitions
PminCylDifEval	0–Nomin Power (kW)	7	10		This setpoint adjusts the generator set power level below which the cylinder temperature difference protection is not evaluated. Learn more about this protection in the description of the setpoint Max+CylDifPmin.
CylDifEvalDel	0–600 s	7	10		This setpoint adjusts the evaluation delay of the cylinder temperature difference protection. Learn more about this protection in the description of the setpoint Max+CylDifPmin.
Service time 1	0–65534 hr.; OFF	2	250 (ESP) 250 (PRP) 133 (COP)		This setpoint is used as maintenance interval counter #1. There are four independent maintenance interval counters, all of them work the same way – their values are decremented every hour while the generator set is running and when the zero value is reached the related alarm is issued (i.e. WrnServiceT1+2 or WrnServiceT3+4). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different types of regular maintenance work such as oil change, spark plug change etc. When the particular maintenance work has been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.
Service time 2	0–65534 hr.; OFF	2	500 (ESP) 800 (PRP) 633 (COP)		This setpoint is used as maintenance interval counter #2. There are four independent maintenance interval counters, all of them work the same way – their values are decremented every hour while the generator set is running and when the zero value is reached the related alarm is issued (i.e. WrnServiceT1+2 or WrnServiceT3+4). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different types of regular maintenance work such as oil change, spark plug change etc. When the particular maintenance work has been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.

Setpoint	Range Setting	Access Level	Default Settings	User-Defined Settings	Definitions
Service time 3	0–65534 hr.; OFF	2	1500 (ESP) 1600 (PRP) 1633 (COP)		This setpoint is used as maintenance interval counter #3. There are four independent maintenance interval counters, all of them work the same way – their values are decremented every hour while the generator set is running and when the zero value is reached the related alarm is issued (i.e. WrnServiceT1+2 or WrnServiceT3+4). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different types of regular maintenance work such as oil change, spark plug change etc. When the particular maintenance work has been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.
Service time 4	0–65534 hr.; OFF	2	6000 (ESP) 4800 (PRP) 3633 (COP)		This setpoint is used as maintenance interval counter #4. There are four independent maintenance interval counters, all of them work the same way – their values are decremented every hour while the generator set is running and when the zero value is reached the related alarm is issued (i.e. WrnServiceT1+2 or WrnServiceT3+4). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different types of regular maintenance work such as oil change, spark plug change etc. When the particular maintenance work has been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.

Generator Protections

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
OverldStrtEval	100–200%	7	150		This setpoint specifies the power level relative to the nominal power, where the thermal overload protection starts to be evaluated. See the setpoint 2PovrldStEvDel for more information about the thermal overload protection.
2POvrldStEvDel	0–600 s	7	7		This setpoint adjusts the reaction time of the thermal overload protection if the load level is 200% of the base level given by the setpoint OverldStrtEval. The reaction time of the thermal overload protection is not fixed; it depends on how much is the load above the limit (base level). The higher is the load the shorter the reaction time will be. **Note:** The thermal overload protection is Breaker open and cool down (BOC) type.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Min power PtM	0–100%	7	5		This setpoint is used for adjusting of the lower limit of the requested generator set power in parallel to the mains operation. If the requested load (given by the active load control mode, e.g. Baseload, Import/Export etc.) is below this limit the requested load is limited to the level adjusted by this setpoint. The only situation, where the Min Power PtM is ignored, is the warming procedure after the generator set is synchronized to the mains, i.e. the Warming load can be adjusted also below the setpoint Min Power PtM. This setpoint is also used as the requested load level if a protection of Low power type is active **Note:** Note that if InteliMains is used and it is in active control mode (i.e. the SysLdCtrl PtM is set to LDSHARING) this setpoint is not considered and minimal power in parallel to Mains operation is given by ProcessControlMinPwr PtM is used to determine minimal power of each generator set in the group in percentage of its nominal power.
Ishort	100–500%	7	500		This setpoint adjusts the threshold level (in % of the nominal current) for the generator fast overcurent protection. The protection is activated (alarm Ishort is issued) when the generator current in at least one phase exceeds the threshold limit for time longer than Ishort del. **Note:** The protection type is Breaker open and cool down (BOC).
Ishort del	0–10 s	7	3.6		This setpoint adjust the delay for generator fast overcurrent protection. The limit for the protection is adjusted by the setpoint Ishort. **Note:** Although the resolution of this setpoint is 0.01 s, in fact the adjusted delay is rounded to the next higher multiple of the period of the generator voltage. The period is either 0.02 s for 50 Hz systems or 0.0166 s for 60 Hz systems. E.g. if the delay is set to 0.03 s at 50 Hz system the real delay will be 0.04 s.
2Inom del	0–600 s	7	ESP = 12 PRP = 12 COP = 7		This setpoint adjusts the reaction time of the IDMT overcurrent protection if the overcurrent level is 200% of the nominal current. The reaction time of the IDMT overcurrent protection is not fixed; it depends on how much is the actual current above the limit (nominal). The higher is the overcurrent the shorter the reaction time will be. **Note:** The IDMT overcurrent protection is Breaker open and cool down (BOC) type.
Gen >V BOC	20–150%	3	110		This setpoint adjusts the threshold level for the generator overvoltage protection. The threshold is adjusted in % of the nominal generator voltage, which is either GenNomV or GenNomVph-ph, depending on the position of the setpoint FixVoltProtSel. The protection activates if the voltage in at least one phase gets over the threshold for time longer than Gen V del. **Note:** The associated protection to this setpoint is Breaker open and cool down (BOC) type. There is also Shutdown overvoltage protection, which is adjusted by setpoint Gen >V Sd. **Note:** The BOC protections are active after the Max stab time elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if Cooling speed = NOMINAL).

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Gen <V BOC	20–110%	3	90		This setpoint adjusts the threshold level for the generator undervoltage protection. The threshold is adjusted in % of the nominal generator voltage, which is either GenNomV or GenNomVph–ph, depending on the position of the setpoint FixVoltProtSel. The protection activates if the voltage in at least one phase drops below the threshold for time longer than Gen V del. **Note:** The generator undervoltage protection is Breaker open and cool down (BOC) type. **Note:** The BOC protections are active after the Max stab time elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if Cooling speed = NOMINAL).
Gen >V Sd	50–150%	3	115		This setpoint adjusts the threshold level for the generator overvoltage shutdown protection. The threshold is adjusted in % of the nominal generator voltage, which is either GenNomV or GenNomVph–ph, depending on the position of the setpoint FixVoltProtSel. The protection activates if the voltage in at least one phase gets over the threshold for time longer than Gen V del. **Note:** The associated protection to this setpoint is Shutdown type. There is also Breaker open and cool down (BOC) overvoltage protection, which is adjusted by setpoint Gen >BOC. The BOC overvoltage protection is intended to be used as first level protection with lower threshold, whereas the shutdown one is intended as second level with higher threshold.
Gen V del	0–600 s	3	5		The setpoint adjusts the delay for generator under– and overvoltage protections. The thresholds for these protections are adjusted by setpoints Gen >V BOC, Gen <V BOC and Gen >V Sd. **Note:** Although the resolution of this setpoint is 0.01s, in fact the adjusted delay is rounded to the next higher multiple of the period of the generator voltage. The period is either 0.02 s for 50 Hz systems or 0.0166 s for 60 Hz systems. E.g. if the delay is set to 0.03 s at 50 Hz system the real delay will be 0.04 s.
Gen >f	90–150%	3	**ESP and PRP** = 120 **COP** = 102		This setpoint adjusts the threshold level for the generator overfrequency protection. The threshold is adjusted in % of the system frequency (Nominal Freq + Nom frq offset). The protection activates if the frequency in phase L3 gets over the threshold for time longer than Gen f del. **Note:** The generator overfrequency protection is Breaker open and cool down (BOC) type. **Note:** The BOC protections are active after the Max stab time elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if Cooling speed = NOMINAL).

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Gen <f	20-120%	3	96		This setpoint adjusts the threshold level for the generator underfrequency protection. The threshold is adjusted in % of the system frequency (Nominal Freq + Nom frq offset). The protection activates if the frequency in phase L3 drops below the threshold for time longer than Gen f del. **Note:** The generator underfrequency protection is Breaker open and cool down (BOC) type. **Note:** The BOC protections are active after the Max stab time elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if Cooling speed = NOMINAL).
Gen f del	0-600 s	3	5		The setpoint adjusts the delay for generator under and overfrequency protections. The thresholds for these protections are adjusted by setpoints Gen >f and Gen <f. **Note:** Although the resolution of this setpoint is 0.01s, in fact the adjusted delay is rounded to the next higher multiple of the period of the generator voltage. The period is either 0.02 s for 50 Hz systems or 0.0166 s for 60 Hz systems. E.g. if the delay is set to 0.03 s at 50 Hz system the real delay will be 0.04 s.
BusMeasError	0 - DISABLED 1 - ENABLED	5	DISABLED		This setpoint is used to enable and disable the Bus meas error alarm. If enabled, it is issued when the controller detects a mismatch between the expected and current voltage on the busbar. The mismatch means the measured voltage is out of limits, although the controller receives information that there is a breaker closed, through which the bus should be supplied. The alarm is issued when the mismatch lasts more than 20 s. The breaker mentioned above may be MCB, GCB of the respective controller or GCB of any other controller in the group. If there is a mismatch of bus voltage then closing of the GCB is blocked even if the 20 s delay hasn't elapsed yet.
Reverse power	0-50%	3	10		This setpoint adjusts the threshold level for the generator reverse (negative) power protection. The threshold is adjusted in % of the generator nominal power. The protection activates if the generator power drops below the threshold for time longer than ReversePwr del **Note:** The generator reverse power protection is Breaker open and cool down (BOC) type.
ReversePwr del	0-600 s	3	5		The setpoint adjusts the delay for generator reverse power protection. The threshold for the protection is adjusted by setpoint Reverse power.
Nom EthFltCurr	0-10000 A	7	10		This setpoint adjust the level of EarthFault Current when IDMT protection starts to get evaluated. Time of evaluation of this protection is given by the setpoint 2EthFltCur del. When the EarthFault Current goes below the level given by Nom EthFltCurr, protection starts decreasing its thermal counter. For more information about this protection, refer to the setpoint 2EthFltCur del.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
2EthFltCur del	OFF; 0.1-600 s	7	OFF		This setpoint adjusts the reaction time of the IDMT EarthFault Current protection if the current is 200% of the base level given by the setpoint Nom EthFltCurr. The reaction time of the IDMT EarthFault Current protection is not fixed; it depends on how much is the current above the limit (base level). The higher is the current the shorter the reaction time will be. **Note:** The IDMT EarthFault Current protection is Breaker open and cool down (BOC) type. **Note:** This protection's internal counter accumulates and it starts continuously decreasing when the EarthFault Current goes below Nom EthFltCurr. This function prevents the protection from completely resetting when the EarthFault Current goes below Nom EthFltCurr for only a short period of time. This behavior emulates circuitbreakerwith thermal current protection.
ExcitationLoss	0-150%	3	20		This setpoint adjusts excitation loss protection level. Corresponding level in kVA is calculated from nominal power of generator set as a negative percentage given by this setpoint (e.g. this setpoint is adjusted to 50% and nominal power of generator set is 200 kW, therefore excitation loss protection level is set to -100 kVAr) Delay for this protection is given by the setpoint ExctLoss del. This protection is breaker off and cooldown type. For more information on protection types please refer to the section Alarm types.
ExctLoss del	OFF; 0.1-600 s	3	5		This setpoint adjusts the delay for loss of excitation protection. Threshold of this protection is given by the setpoint ExcitationLoss.
Gen V unbal	0-200%	3	5		This setpoint adjusts the threshold level for the generator voltage unbalance protection. The threshold is adjusted in % of the nominal generator voltage, which is either GenNomV or GenNomVph-ph, depending on the position of the setpoint FixVoltProtSel. The protection is Breaker open and cool down type and is created in the default archive as universal analog protection at the value Gen V unbal, which is calculated as maximum difference between two phase voltages. The protection activates if the voltage unbalance gets over the threshold for time longer than Gen V unb del. **Note:** The voltage unbalance protection is created in the default archive using the mechanism of universal analog protections. That means this setpoint is one of general-purpose setpoints, which may be used for different purpose if the protection is deleted from the configuration.
Gen V unb del	0-600 s	3	10		This setpoint adjusts the delay for the generator voltage unbalance protection. The threshold for the protection is adjusted by setpoint Gen V unbal. **Note:** The generator voltage unbalance protection is created in the default archive using the mechanism of universal analog protections. That means this setpoint is one of general-purpose setpoints, which may be used for different purpose if the protection is deleted from the configuration.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Gen I unbal	0–200%	3	10		This setpoint adjusts the threshold level for the generator current unbalance protection. The threshold is adjusted in % of the generator nominal current. The protection is Breaker open and cool down type and is created in the default archive as universal analog protection at the value Gen I unbal, which is calculated as maximum difference between two phase currents. The protection activates if the current unbalance gets over the threshold for time longer than Gen I unb del. **Note:** The current unbalance protection is created in the default archive using the mechanism of universal analog protections. That means this setpoint is one of general–purpose setpoints, which may be used for different purpose if the protection is deleted from the configuration.
Gen I unb del	0–600 s	3	5		This setpoint adjusts the delay for the generator current unbalance protection. The threshold for the protection is adjusted by setpoint Gen I unbal. **Note:** The generator current unbalance protection is created in the default archive using the mechanism of universal analog protections. That means this setpoint is one of general–purpose setpoints, which may be used for different purpose if the protection is deleted from the configuration.
OvrCrntWrn Lim	0–150%	4	100		This setpoint sets the overcurrent warning threshold as a percentage of rated current. If the current in any phase exceeds this threshold for a period of time greater than the delay (OvrCrntWrn Del), the controller issues an overcurrent warning alarm.
OvrCrntSd Lim	0–200%	4	150		This setpoint sets the overcurrent shutdown threshold as a percentage of rated current. If the current in any phase exceeds this threshold for a period of time greater than the delay (OvrCrntWrn Del), the controller issues an overcurrent shutdown alarm and shuts down the generator set.
OvrCrntWrn Del	0–600 s	4	5		This setpoint sets the length of time that the generator set current must exceed the threshold before the controller issues an alarm.
OvrCrntSd Del	0–600 s	4	30		This setpoint sets the length of time that the generator set current must exceed the threshold before the controller issues an overcurrent shutdown alarm and shuts down the generator set.

Power Management

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Pwr management	0 - DISABLED 1 - ENABLED	4	DISABLED		This setpoint is used to enable/disable the power management function in the particular controller. If the function is disabled the start and stop of the generator set is performed only according to the position of the binary input Sys start/stop, i.e. if the input is active the generator set is running and vice versa.
#Pwr mgmt mode		4	ABS (kW)		This setpoint is used to select the power management mode: **ABS (KW)** The power management is based on actual active power and generator set nominal power. The reserves are calculated and adjusted in kW. **ABS (KVA)** The power management is based on actual apparent power and generator set *nominal apparent power* is calculated as 3 * Nomin current * GenNomV. The reserves are calculated and adjusted in kVA. **Note:** This mode is intended for systems supplying loads with low power factor. It prevents the generator sets from operating at high currents. **REL (%)** The power management is based on the relative load, i.e. ratio active power to nominal power. The reserves are calculated and adjusted in %.
Priority	0–32	4	1		This setpoint is used for adjusting of the generator set priority. Value of 1 represents the highest priority (lowest starting order), value of 32 is the lowest priority (highest starting order). To *push* the particular genset temporarily into the highest priority, value of 0 can be forced (see Force value) into this setpoint.
#PriorAutoSwap	0 - DISABLED 1 - ENABLED	4	DISABLED		This setpoint selects the method of optimization of priorities: **DISABLED** Optimization is disabled. Priorities are given directly by the values adjusted into the setpoints Priority. **RUN HOURS EQU** The priority setpoints are automatically updated (swapped) to equalize running hours of the generator sets or to keep constant difference of running hours. **LD DEMAND SWAP** This method changes the priorities (not the setpoints itself) of up to 3 generator sets of different capacity to optimize which generator sets are running according to their capacities and actual load demand. Note that this priority swapping function may be used only if Pwr mgmt mode is set to ABS (kW). **Note:** Setpoint Priority in generator set controllers is not actually changed by AutoSwap functions – the priority is changed only locally during AutoSwap function is enabled. Note that after RHE is activated any changes in the actual priority setpoints need to be confirmed by disabling and enabling RHE again to take effect. **Note:** If the optimization is enabled at least one generator set in the group must be set as the master for the optimization (Priority ctrl = MASTER). It is possible to have more than one master, the one with lowest CAN address will play the role of the master and if it is switched off the next one will take the master role. **IMPORTANT!** If the controller which is set to MASTER in PriorAutoSwap function is in Emergency manual, priority autoswapping will not work and no other controller will assume MASTER role.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Priority ctrl	0 - SLAVE 1 - MASTER	4	SLAVE		This setpoint is used to select the role of this particular controller in the optimization of priorities. **SLAVE** The controller plays only passive role. Priority can be changed from other controller (active master). **MASTER** The controller can play both active or passive role. It plays active master role, i.e. changes priorities in slave controllers, if it has the lowest address from all the controllers being switched to MASTER position. Otherwise it plays the passive role as if switched to SLAVE position. **Note:** It is possible to have more than one master; always only the one with lowest CAN address will play the master role.
#SysAMFstrtDel	0-600 s	4	0		This setpoint adjusts the delay between closing of the input Sys start/stop and activation of the generator set group into island operation (i.e. the MCB feedback is open). The delay of activation of the group into parallel-to-mains operation is fixed 1 s. The setpoint is primarily intended for adjusting the *Mains failure autostart* delay in sites, where the input Sys start/stop is controlled directly by a mains decoupling relay.
#SysAMFstopDel	0-600 s	4	0		This setpoint adjusts the delay between opening of the input Sys start/stop and deactivation of the generator set group if MCB feedback is open. If the MCB feedback is closed, the delay is fixed 1 s. The setpoint is primarily intended for adjusting the *Mains return* delay in sites, where the input Sys start/stop is controlled directly by a mains decoupling relay.
#LoadResStrt 1	-32000-170 kX	4	140		This setpoint is used to adjust the load reserve for start in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #1 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** If the absolute power management is selected, this setpoint (or the setpoints LoadResStrt 2, LoadResStrt 3 or LoadResStrt 4 depending on which load reserve set is selected) determines also the number of generator sets (that are part of the power management) which will start (according to their priority and nominal power). **Note:** There is a possibility to assign this setpoint negative number. This can be used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. **Note:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.
#LoadResStop 1	140-32000 kX	4	170		This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #1 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** The reserve for stop must be always adjusted higher than the reserve for start.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#LoadResStrt 2	-32000-180 kX	4	150		This setpoint is used to adjust the load reserve for start in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #2 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** If the absolute power management is selected, this setpoint (or the setpoints LoadResStrt 1, LoadResStrt 3 or LoadResStrt 4 depending on which load reserve set is selected) determines also the number of generator sets (that are part of the power management) which will start (according to their priority and nominal power). **Note:** There is a possibility to assign this setpoint negative number. This can be used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. **Note:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.
#LoadResStop 2	150-32000 kX	4	180		This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #2 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** The reserve for stop must be always adjusted higher than the reserve for start.
#LoadResStrt 3	-32000-170 kX	4	140		This setpoint is used to adjust the load reserve for start in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #3 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** If the absolute power management is selected, this setpoint (or the setpoints LoadResStrt 1, LoadResStrt 2 or LoadResStrt 4 depending on which load reserve set is selected) determines also the number of generator sets (that are part of the power management) which will start (according to their priority and nominal power). **Note:** There is a possibility to assign this setpoint negative number. This can be used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. **Note:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.
#LoadResStop 3	140-32000 kX	4	170		This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #3 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** The reserve for stop must be always adjusted higher than the reserve for start.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#LoadResStrt 4	-32000-170 kX	4	140		This setpoint is used to adjust the load reserve for start in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #4 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** If the absolute power management is selected, this setpoint (or the setpoints LoadResStrt 1, LoadResStrt 2 or LoadResStrt 3 depending on which load reserve set is selected) determines also the number of generator sets (that are part of the power management) which will start (according to their priority and nominal power). **Note:** There is a possibility to assign this setpoint negative number. This can be used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. **Note:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.
#LoadResStop 4	140-32000 kX	4	170		This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. Pwr mgmt mode = ABS (kW) or ABS (kVA) if the reserve set #4 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** The reserve for stop must be always adjusted higher than the reserve for start.
#%LdResStrt 1	0-80%	4	60		This setpoint is used to adjust the load reserve for start in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #1 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected.
#%LdResStop 1	60-110%	4	80		This setpoint is used to adjust the load reserve for stop in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #1 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** The reserve for stop must be always adjusted higher than the reserve for start.
#%LdResStrt 2	0-85%	4	70		This setpoint is used to adjust the load reserve for start in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #2 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected.
#%LdResStop 2	70-110%	4	85		This setpoint is used to adjust the load reserve for stop in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #2 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected **Note:** The reserve for stop must be always adjusted higher than the reserve for start.
#%LdResStrt 3	0-80%	4	60		This setpoint is used to adjust the load reserve for start in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #3 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected.

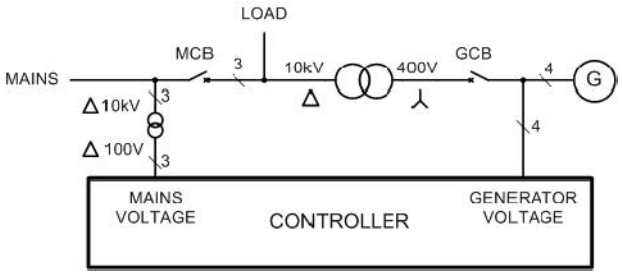
Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#%LdResStop 3	60-110%	4	80		This setpoint is used to adjust the load reserve for stop in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #3 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** The reserve for stop must be always adjusted higher than the reserve for start.
#%LdResStrt 4	0-80%	4	60		This setpoint is used to adjust the load reserve for start in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #4 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected.
#%LdResStop 4	60-110%	4	80		This setpoint is used to adjust the load reserve for stop in relative mode. i.e. Pwr mgmt mode = REL (%) if the reserve set #4 is active. The currently active reserve set is selected by binary inputs Load res 2, Load res 3 and Load res 4. If none of these inputs is active the set #1 is selected. **Note:** The reserve for stop must be always adjusted higher than the reserve for start.
#NextStrt del	0-3600 s	4	10		This setpoint is used to adjust the delay of starting the next generator set when the actual load reserve drops below the adjusted reserve for start, but the group is still not overloaded.
#OverldNextDel	0-3600 s	4	10		If the system reserve drops below the start limit for next generator set the delay #NextStrt del will begin to count down. But if the load raises too quickly it might happen that the system gets overloaded already before the delay #NextStrt del reaches zero. This setpoint is used to prevent this situation. If the #NextStrt del timer is already counting down (i.e. the condition for starting of next generator set based on reserves is fulfilled), the total load of running generator sets reaches 90% of their nominal capacity and the remaining time of the running timer is higher than #OverldNextDel, the running timer is shortened to the value of #OverldNextDel to speed up the start-up of the next generator set. **Note:** The setpoint takes place only in island operation.
#NextStopDel	0-3600 s	4	10		This setpoint is used to adjust the delay of stopping the next generator set when the actual load reserve rises above the adjusted load reserve for stop.
#SlowStopDel	0-600 s	4	10		This setpoint is used to adjust how long the particular generator set will suppress it's own Slow stop alarm to give chance to another generator set to start and replace the defective one. If there isn't any available generator set to start, the alarm is not suppressed.
#MinRunPower 1	0-65000 kW	4	100		This setpoint is used to adjust certain minimum value of the sum of nominal power of all running generator sets. If the function is active, then the generator sets would not be stopped, although the reserve for stop is fulfilled, if the total remaining nominal power dropped below this minimal value. There are 3 different MinRunPower setpoints, this particular one is activated by the input MinRun power 1. **Note:** If more than one binary input for MinRunPower activation is closed MinRunPower with higher number is used (i.e. binary inputs with higher number have higher priority). When no binary input is closed, then minimal running power is 0.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#MinRunPower 2	0-65000 kW	4	200		This setpoint is used to adjust certain minimum value of the sum of nominal power of all running generator sets. If the function is active, then the generator sets would not be stopped, although the reserve for stop is fulfilled, if the total remaining nominal power dropped below this minimal value. There are 3 different MinRunPower setpoints, this particular one is activated by the input MinRun power 2. **Note:** If more than one binary input for MinRunPower activation is closed MinRunPower with higher number is used (i.e. binary inputs with higher number have higher priority). When no binary input is closed, then minimal running power is 0.
#MinRunPower 3	0-65000 kW	4	300		This setpoint is used to adjust certain minimum value of the sum of nominal power of all running generator sets. If the function is active, then the generator sets would not be stopped, although the reserve for stop is fulfilled, if the total remaining nominal power dropped below this minimal value. There are 3 different MinRunPower setpoints, this particular one is activated by the input MinRun power 3. **Note:** If more than one binary input for MinRunPower activation is closed MinRunPower with higher number is used (i.e. binary inputs with higher number have higher priority). When no binary input is closed, then minimal running power is 0.
RunHoursBase	0-200000 hr.	4	0		This setpoint is used for adjustment of the *initial point* of the running hours equalization function. It is used either for reflecting the difference of engine hours in the moment when the RHE function was activated or for keeping certain constant difference in the engine hours.
#RunHrsMaxDiff	0-65000 hr.	4	100		This setpoint adjusts the *deadband* for the running hours equalization function. The priorities are swapped not until the relative engine hours (RHE) difference is higher than this deadband
#PwrBandContr1	0 - 1 1 - 2 2 - 1+2 3 - 3 4 - 1+3 5 - 2+3 6 - 1+2+3	4	1		This setpoint is used to select the generator sets which will run within the power band #1 if the optimization according to generator set size is active. **Note:** The combinations of generator sets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4.
#PwrBandContr2	0 - 1 1 - 2 2 - 1+2 3 - 3 4 - 1+3 5 - 2+3 6 - 1+2+3	4	2		This setpoint is used to select the generator sets which will run within the power band #2 if the optimization according to generator set size is active. **Note:** The combinations of generator sets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4
#PwrBandContr3	0 - 1 1 - 2 2 - 1+2 3 - 3 4 - 1+3 5 - 2+3 6 - 1+2+3	4	3		This setpoint is used to select the generator sets which will run within the power band #3 if the optimization according to generator set size is active. **Note:** The combinations of generator sets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4.
#PwrBandContr4	0 - 1 1 - 2 2 - 1+2 3 - 3 4 - 1+3 5 - 2+3 6 - 1+2+3	4	1+2+3		This setpoint is used to select the generator sets which will run within the power band #4 if the optimization according to generator set size is active. **Note:** The combinations of generator sets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4.
#PwrBnChngDlUp	0-3600 s	4	10		This setpoint is used for adjusting the delay of changing the power band if the load demand rose above the upper limit of the current power band.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
#PwrBnChngDlDn	0–3600 s	4	10		This setpoint is used for adjusting the delay of changing the power band if the load demand dropped below the lower limit of the current power band.
Control group	COMMON; 2–32	4	COMMON		This setpoint selects the logical group to which the particular generator set belongs. If there aren't logical groups at the site, adjust the setpoint to 1 (COMMON).
GroupLinkLeft	COMMON; 2–32	4	COMMON		If the input GroupLink of this particular controller is used to provide the *group link* information for two logical groups, then this setpoint is used to select which group is located at the left side of the group link breaker (bus tie breaker). If this particular controller is not used for the group link function adjust this setpoint to 1 (COMMON).
GroupLinkRight	COMMON; 2–32	4	COMMON		If the input GroupLink of this particular controller is used to provide the *group link* information for two logical groups, then this setpoint is used to select which group is located at the right side of the group link breaker (bus tie breaker). If this particular controller is not used for the group link function adjust this setpoint to 1 (COMMON).

Synchronization/Load Control

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
SpeedRegChar	0-POSITIVE 1-NEGATIVE	4	POSITIVE		This setpoint selects the characteristic of the speed governor output of the controller. Adjust it according to the behavior of the remote speed input of your speed governor: **POSITIVE** Select this option if raising of the voltage on the governor remote speed input causes engine speed to raise. **NEGATIVE** Select this option if raising of the voltage on the governor remote speed input causes engine speed to lower.
Voltage window	0-100%	4	10		This setpoint adjusts maximum difference between generator and mains/bus voltage in respective phases for voltage matching during synchronizing.
GtoM AngleReq	-45-45°	4	0		Requested angle between the phasors of the generator and mains voltage for synchronizing. This setpoint is intended for correction of the phase shift caused by a delta-triangle transformer located between the generator and mains voltage measuring points. In other situations the setpoint should be adjusted to 0. The diagram below shows a situation where the 230 V/10 kV triangle-delta transformer causes 30° phase shift between the primary and secondary side. That means when there is 0° phase difference at the both sides of the GCB the phase difference measured by the controller is 30°. Correct setting for this kind of wiring is then GtoM AngleReq = 30.



Phase window	0-90°	4	5		This setpoint adjusts maximum absolute value of difference between actual phase angle between the generator and mains/bus voltages for synchronizing. **Note:** To disable issuing the breaker close command (i.e. for test purpose) adjust this setpoint to 0. Synchronizing will continue until timeout occurs or the breaker is closed externally.
Dwell time	0-25 s	4	0.3		This setpoint adjusts the period of time that the phase angle difference must stay within +/-Phase Window and voltage difference within Voltage Window before the respective breaker, which is actually being synchronized, is closed.
Freq gain	0-200%	4	0		This setpoint adjusts the gain factor (P-factor) of the frequency control PI loop. The integration factor (I-factor) for the frequency loop is adjusted by the setpoint Freq int.
Freq int	0-100%	4	0		This setpoint adjusts the relative integration factor (I-factor) of the frequency control PI loop. The gain factor (P-factor) for the frequency loop is adjusted by the setpoint Freq gain

Freq reg loop	0-GCB OPEN 1-SYNC ONLY	4	SYNC ONLY		This setpoint selects when is the frequency regulation loop active. **SYNC ONLY** The frequency regulation loop is active only during synchronizing to match the generator and mains frequencies together. It is assumed that in all other situations where the frequency is to be regulated the engine governor maintains it self. **Note:** This option is suitable for most governors. **ALL THE TIME** SPtM, SPI, Combi: This option activates the frequency regulation loop also while the generator set is running without load and during the island operation. The controller maintains frequency at it's nominal value adjusted by setpoint system frequency (Nominal Freq + Nom frq offset). **Note:** This option can be used e.g. for elimination of the droop at governors that do not support isochronous mode. **GCB OPEN** MINT, COX: This option activates the frequency regulation loop also while the generator set is running without load The controller maintains frequency at it's nominal value adjusted by the system frequency (Nominal Freq + Nom frq offset). The P and I factors of the frequency regulation loop are adjusted by setpoints Freq gain and Freq int.
Angle gain	0-200%	4	0		This setpoint is used for adjusting of the gain factor (P-factor) of the phase angle P-control loop. The synchronizing process contains two following steps: • The first step is to match the generator frequency to the mains frequency. In this step the frequency regulation loop (Freq reg loop) is active. • The following step is to match the phase angle difference of the mains and generator voltages to the setpoint GtoM AngleReq. The angle regulation loop is active in this step. As soon as the phase angle difference stays within the window adjusted by Phase window and the voltage difference stays in the Voltage window, both for period Dwell time, the circuit breaker closing command is issued.
Speed gov bias	-9-9 V	4	0		This setpoint adjusts the initial voltage level for the speed governor output, which is present on the output, if no speed or power regulation loop is active.
SpdGovPWM rate	500-3000 Hz	4	1200		This setpoint adjusts the frequency of the speed governor output in PWM mode. The PWM mode of the speed governor output is activated by the jumper located next to the speed governor output terminals. Adjust the PWM frequency according to the governor specification. Adjust the setpoint to 1200 Hz if the PWM interface is not used.
SpeedGovLowLim	-10-9 V	4	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = -9 **1300REZCK** = -10		Lower limit of the speed governor output. Use this setpoint to adapt the governor output range to the input range of your governor
SpeedGovHiLim	-9-10 V	4	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 9 **1300REZCK** = 10		Upper limit of the speed governor output. Use this setpoint to adapt the governor output range to the input range of your governor.

TauSpeedActuat	1–300 s	4	10		This setpoint is used to adjust the transformation ratio of the speed governor output to the pulses at the binary outputs Speed up and Speed dn. Adjust the setpoint to the pulse duration which is needed for the speed control device to travel from minimal position to the maximal position.
Load ramp	0–120 s	4	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 60 **1300REZCK** = 120		All changes of requested generator set load (except in loadsharing mode) are not made as one step, but are ramped – i.e. the requested load is changing slowly with the rate adjusted by this setpoint. The rate is adjusted in seconds for 100% load change (from 0 to 100% of nominal power). The ramp takes place in following situations: • The generator set has been just synchronized and is ramping up to the target load level (e.g. baseload in parallel to mains operation or average generator set load in multiple loadsharing operation). The starting point of the ramp for this case is adjustable by the setpoint RampStartLevel. • The generator set is running parallel to the mains and baseload is changed. • The generator set is being unloaded before opening the GCB and stop. In this case the end load level is adjusted by setpoint GCB Open Level and the timeout for unloading is adjusted by setpoint GCB Open Del.
Load gain	0–200%	4	0		This setpoint adjusts the gain factor (P-factor) of the load control PI loop. The integration factor (I-factor) for the load control loop is adjusted by the setpoint Load int.
Load int	0–100%	4	0		This setpoint adjusts the relative integration factor (I-factor) of the load control PI loop. The gain factor (P-factor) for the load control loop is adjusted by the setpoint Load gain.
RampStartLevel	0–100%	4	2		This setpoint adjusts the load level at which the Load ramp starts after the GCB has been closed. The intention of this setpoint is to give the generator set certain ”loading impulse” right after closing the GCB to avoid possible oscillations around 0kW or even reverse power if the ramp begun at 0kW.
GCB open level	0–100%	4	2		This setpoint adjusts the end point of the generator set unloading ramp, i.e. power level at which the GCB is opened. If this level is not reached within time period adjusted by setpoint GCB open del the GCB is then opened regardless of the generator set power. **Note:** The speed of the ramp is adjusted by the setpoint Load ramp.
GCB open del	60–1800 s	4	120		This setpoint adjusts the maximum duration of the generator set unloading ramp. If the end point of the ramp (GCB open level) is not reached within time period adjusted by this setpoint the GCB is then opened regardless of the generator set power. **Note:** The speed of the ramp is adjusted by the setpoint Load ramp.
Sync timeout	1–1800 s; NO TIMEOUT	4	NO TIMEOUT		This setpoint adjusts the maximum duration of forward or reverse synchronization. If the synchronizing is not successful within this period of time, the Sync Timeout or RevSyncTimeout alarm will be issued. **Note:** If the synchronizing is not successful within 1/10 of the Sync timeout or 60 s (if Sync timeout <600s) the synchronization process is automatically restarted again, i.e. the speed governor output is reset to bias value and then frequency regulation loop is started again. If NO TIMEOUT is selected the automatic restart occurs every 180 s. This method helps to synchronize successfully even in difficult conditions.

LS gain	0–200%	4	0		This setpoint adjusts the gain factor (P-factor) of the load–sharing PI loop. The integration factor (I-factor) for the load–sharing loop is adjusted by the setpoint LS int.
LS int	0–100%	4	0		This setpoint adjusts the relative integration factor (I-factor) of the load–sharing PI loop. The gain factor (P-factor) for the load-sharing loop is adjusted by the setpoint LS gain.

Voltage/Power Factor Control

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
AVRRegChar	0-POSITIVE 1-NEGATIVE	4	POSITIVE		This setpoint selects the characteristic of the AVRi output of the controller. Adjust it according to the behavior of the remote voltage adjustment input of your AVR: **POSITIVE** Select this option if raising of the voltage on the remote voltage adjustment input causes the generator voltage to raise. **NEGATIVE** Select this option if raising of the voltage on the remote voltage adjustment input causes the generator voltage to lower. **Note:** The characteristic can be also inverted by swapping the AVRi outputs that are connected to the AVR. However, it is recommended to use the AVRRegChar setpoint for selection of the characteristic instead of swapping the wires.
Voltage gain	0-200%	4	0		This setpoint adjusts the gain factor (P-factor) of the voltage control PI loop. The integration factor (I-factor) for the voltage control loop is adjusted by the setpoint Voltage int.
Voltage int	0-100%	4	0		This setpoint adjusts the relative integration factor (I-factor) of the voltage control PI loop. The gain factor (P-factor) for the voltage control loop is adjusted by the setpoint Voltage gain.
PF gain	0-200%	4	0		This setpoint adjusts the gain factor (P-factor) of the cos-phi control PI loop. The integration factor (I-factor) for the cos-phi control loop is adjusted by the setpoint PF int.
PF int	0-100%	4	0		This setpoint adjusts the relative integration factor (I-factor) of the cos-phi control PI loop. The gain factor (P-factor) for the cos-phi control loop is adjusted by the setpoint PF gain.
AVR DCout bias	0-100%	4	50		This setpoint adjusts the initial level for the AVRi output. This level is present on the output if no regulation loop is active. **Note:** The resulting voltage at the input of the AVR also depends on position of the trimmer at the AVRi module.
VS gain	0-200%	4	0		This setpoint adjusts the gain factor (P-factor) of the VAr-sharing PI loop. The integration factor (I-factor) for the VAr-sharing loop is adjusted by the setpoint VS int.
VS int	0-100%	4	0		This setpoint adjusts the relative integration factor (I-factor) of the VAr-sharing PI loop. The gain factor (P-factor) for the VAr-sharing loop is adjusted by the setpoint VS gain.
TauVoltActuat	1-300 s	4	10		This setpoint is used to adjust the transformation ratio of the AVRi output to the pulses at the binary outputs AVR up and AVR dn. Adjust the setpoint to the pulse duration which is needed for the AVR to change the requested voltage from minimum to maximum.

Force Value

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Force value 1	0–3600 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 240 **1300REZCK** = 0		Prestart time in seconds when prelube runs and when oil temperature is between 40 – 60 C (105 – 140 F) (ESP & PRP only). Force value 1 reduces the prestart time to this value when oil temperature falls within this temperature range.
Force value 2	1–240 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 180 **1300REZCK** = 0		Prestart time in seconds when prelube runs and when oil temperature is between 60 – 90 C (140 – 194 F) (ESP & PRP only). Force value 2 reduces the prestart time to this value when oil temperature falls within this temperature range.
Force Value 3	5–60 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 120 **1300REZCK** = 0		Prestart time in seconds when prelube runs and oil temperature is above 90 C (194 F) (ESP & PRP only). Force value 3 reduces the prestart time to this value when oil temperature falls within this temperature range.
Force value 4	0–1500 RPM	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 50 **1300REZCK** = 0		Underspeed limit after crank disconnect (ESP & PRP only).
Force value 5	0	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 30 **1300REZCK** = 0		Cranking time after 2nd crank attempt (ESP & PRP only).
Force value 6	0	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 60 **1300REZCK** = 0		Pause time after 2nd crank attempt (ESP & PRP only).

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Force value 7	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
Force value 8	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1 **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
Force value 9	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
Force value 10	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1 **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Force value 11	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
Force value 12	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
Force value 13	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
Force value 14	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Force value 15	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
Force value 16	0	7	0		This is one of the 16 setpoints reserved for use as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input Force value 1. **Note:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **Note:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name Force value 3 is not related to the Force value 3 function block.
ExtValue1LoLim	-32000-0 X	7	0		This setpoint adjusts the low limit of the value of ExtValue 1 if the value is lowered/raised by the binary inputs ExtValue1 up and ExtValue1 down. The ExtValue 1 is never lowered below this limit. **Note:** This limit is not taken into account if the value ExtValue 1 is written remotely from a terminal using the appropriate command ExtValue #n.
ExtValue1HiLim	0-32000 X	7	0		This setpoint adjusts the high limit of the value of ExtValue 1 if the value is lowered/raised by the binary inputs ExtValue1 up and ExtValue1 down. The ExtValue 1 is never raised over this limit. **Note:** This limit is not taken into account if the value ExtValue 1 is written remotely from a terminal using the appropriate command ExtValue #n.
ExtValue1 rate	1-10000 X/s	7	1		This setpoint adjusts the rate per second at which the ExtValue 1 is being changed while the input ExtValue1 up or ExtValue1 down is active.
ExtValue1deflt	0 X	7	0		This setpoint adjusts the reset (initial) value of the ExtValue 1. This initial value is applied either when the controller is powered-on or when the ExtValue 1 is reset by the binary input ExtValue1reset.
ExtValue2LoLim	-32000-0 X	7	0		This setpoint adjusts the low limit of the value of ExtValue 2 if the value is lowered/raised by the binary inputs ExtValue2 up and ExtValue2 down. The ExtValue 2 is never lowered below this limit. **Note:** This limit is not taken into account if the value ExtValue 2 is written remotely from a terminal using the appropriate command ExtValue #n.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
ExtValue2HiLim	0–32000 X	7	0		This setpoint adjusts the high limit of the value of ExtValue 2 if the value is lowered/raised by the binary inputs ExtValue2 up and ExtValue2 down. The ExtValue 2 is never raised over this limit. **Note:** This limit is not taken into account if the value ExtValue 2 is written remotely from a terminal using the appropriate command ExtValue #n.
ExtValue2 rate	1–10000 X/s	7	1		This setpoint adjusts the rate per second at which the ExtValue 2 is being changed while the input ExtValue2 up or ExtValue2 down is active.
ExtValue2deflt	0 X	7	0		This setpoint adjusts the reset (initial) value of the ExtValue 2. This initial value is applied either when the controller is powered-on or when the ExtValue 2 is reset by the binary input ExtValue2reset.
ExtValue3LoLim	-32000–0 X	7	0		This setpoint adjusts the low limit of the value of ExtValue 3 if the value is lowered/raised by the binary inputs ExtValue3 up and ExtValue3 down. The ExtValue 3 is never lowered below this limit. **Note:** This limit is not taken into account if the value ExtValue 3 is written remotely from a terminal using the appropriate command ExtValue #n.
ExtValue3HiLim	0–32000 X	7	0		This setpoint adjusts the high limit of the value of ExtValue 3 if the value is lowered/raised by the binary inputs ExtValue3 up and ExtValue3 down. The ExtValue 3 is never raised over this limit. **Note:** This limit is not taken into account if the value ExtValue 3 is written remotely from a terminal using the appropriate command ExtValue #n.
ExtValue3 rate	1–10000 X/s	7	1		This setpoint adjusts the rate per second at which the ExtValue 3 is being changed while the input ExtValue3 up or ExtValue3 down is active.
ExtValue3deflt	0 X	7	0		This setpoint adjusts the reset (initial) value of the ExtValue 3. This initial value is applied either when the controller is powered-on or when the ExtValue 3 is reset by the binary input ExtValue3reset.
ExtValue4LoLim	-32000–0 X	7	0		This setpoint adjusts the low limit of the value of ExtValue 4 if the value is lowered/raised by the binary inputs ExtValue4 up and ExtValue4 down. The ExtValue 4 is never lowered below this limit. **Note:** This limit is not taken into account if the value ExtValue 4 is written remotely from a terminal using the appropriate command ExtValue #n.
ExtValue4HiLim	0–32000 X	7	0		This setpoint adjusts the high limit of the value of ExtValue 4 if the value is lowered/raised by the binary inputs ExtValue4 up and ExtValue4 down. The ExtValue 4 is never raised over this limit. **Note:** This limit is not taken into account if the value ExtValue 4 is written remotely from a terminal using the appropriate command ExtValue #n.
ExtValue4 rate	1–10000 X/s	7	1		This setpoint adjusts the rate per second at which the ExtValue 4 is being changed while the input ExtValue4 up or ExtValue4 down is active
ExtValue4deflt	0 X	7	0		This setpoint adjusts the reset (initial) value of the ExtValue 4. This initial value is applied either when the controller is powered-on or when the ExtValue 4 is reset by the binary input ExtValue4reset.

Load Shedding

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Ld shed active	0-DISABLED 1-ISLAND ONLY 2-ISL+TRIP PARAL 3-ALL THE TIME	2	DISABLE		This setpoint is used for adjustment when the load shedding function will be active. **DISABLED** The Load shedding function is disabled. All the outputs are open. **ISLAND ONLY** In Island operation (e.g. MCB is open and MGCB is closed) Load shedding outputs (e.g. LdShed stage 1) are controlled by load shedding function. **ISL+TRIP PARAL** This setting adjusts the same behavior as ISLAND ONLY but in addition to it all load shedding outputs are closed when generator set group goes to island operation. **ALL THE TIME** Outputs are controlled by the load shedding function regardless of breaker positions.
Ld shed level	20-200%	2	80		This setpoint is used to adjust the relative load level (in % of nominal power of generator set) for load shedding. When the relative load level exceeds this level for more than Ld shed delay time the next load shedding output is closed.
Ld shed delay	0-600 s	2	10		This setpoint is used to adjust time period the relative load level must be above the Ld shed level limit to close the next load shedding output
Ld recon level	0-80%	2	20		This setpoint is used to adjust the relative load level (in % of nominal power of generator set) for load reconnection. When the relative load level drops below this level for more than Ld recon delay time the next load can be reconnected back. The appropriate load shedding output is either opened automatically when the condition above is fulfilled (AutoLd recon = ENABLED) or manually by activation of the input ManualLdRecon.
Ld recon delay	0-600 s	2	10		This setpoint is used to adjust time period the relative load level must be below the Ld recon level limit to allow reconnection of next load group.
AutoLd recon	0-DISABLED 1-ENABLED	2	ENABLED		This setpoint selects whether the reconnection of the load occurs automatically when the relative load level stays below the reconnection limit for a period of the reconnection delay or the reconnection must be initiated manually by the input ManualLdRecon.

Timer Settings

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
TimerChannel 1		7	OFF		This setpoint adjusts the mode of the Timer channel #1. Output from this channel is available in the combined output TimerAct 1-4.
TimerChannel 2		7	OFF		This setpoint adjusts the mode of the Timer channel #2. Output from this channel is available in the combined output TimerAct 1-4.
TimerChannel 3		7	OFF		This setpoint adjusts the mode of the Timer channel #3. Output from this channel is available in the combined output TimerAct 1-4.
TimerChannel 4		7	OFF		This setpoint adjusts the mode of the Timer channel #4. Output from this channel is available in the combined output TimerAct 1-4.
TimerChannel 5		7	OFF		This setpoint adjusts the mode of the Timer channel #5. Output from this channel is available in the combined output TimerAct 5-8.
TimerChannel 6		7	OFF		This setpoint adjusts the mode of the Timer channel #6. Output from this channel is available in the combined output TimerAct 5-8.
TimerChannel 7		7	OFF		This setpoint adjusts the mode of the Timer channel #7. Output from this channel is available in the combined output TimerAct 5-8.
TimerChannel 8		7	OFF		This setpoint adjusts the mode of the Timer channel #8. Output from this channel is available in the combined output TimerAct 5-8.
TimerChannel 9		7	OFF		This setpoint adjusts the mode of the Timer channel #9. Output from this channel is available in the combined output TimerAct 9-12.
TimerChannel10		7	OFF		This setpoint adjusts the mode of the Timer channel #10. Output from this channel is available in the combined output TimerAct 9-12.
TimerChannel11		7	OFF		This setpoint adjusts the mode of the Timer channel #11. Output from this channel is available in the combined output TimerAct 9-12.
TimerChannel12		7	OFF		This setpoint adjusts the mode of the Timer channel #12. Output from this channel is available in the combined output TimerAct 9-12.
TimerChannel13		7	OFF		This setpoint adjusts the mode of the Timer channel #13. Output from this channel is available in the combined output TimerAct 13-16.
TimerChannel14		7	OFF		This setpoint adjusts the mode of the Timer channel #14. Output from this channel is available in the combined output TimerAct 13-16.
TimerChannel15		7	OFF		This setpoint adjusts the mode of the Timer channel #15. Output from this channel is available in the combined output TimerAct 13-16.
TimerChannel16		7	OFF		This setpoint adjusts the mode of the Timer channel #16. Output from this channel is available in the combined output TimerAct 13-16.

Active Calls/SMS

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
History record	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a "protection" configured as History record occurs. **Note:** As the History record protection does not appear in the alarmlist, the SMS or email may contain empty alarmlist.
Alarm only	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a *protection* configured as Alarm only occurs.
Warning	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a warning type protection occurs.
Off load	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a *protection* configured as Off load occurs. **Note:** As the Off load protection does not appear in the alarmlist, the SMS or e-mail may contain empty alarmlist.
BrkOpen&CoolDn	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a BrkOpen&CoolDn-type alarm occurs.
Mains protect	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a *protection* configured as Mains protect occurs. **Note:** As the Mains protect protection does not appear in the alarmlist, the SMS or email may contain empty alarmlist.
Slow stop	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a Slow stop-type alarm occurs.
Shutdown	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a Shutdown-type alarm occurs.
ShutdownOvr	0 - DISABLED 1 - ENABLED	1	DISABLED		This setpoint is used to enable sending SMS and/or e-mail alerts when a Sd Override-type alarm occurs.
AcallCH1-Type	0 - DISABLED 1 - DATA-ANA 2 - DATA-GSM 3 - DATA-ISDN 4 - DATA-CDMA 5 - SMS-GSM 6 -SMS-CDMA 7 - IB E-MAIL 8 - IB-EML-SMS	1	DISABLED		The setpoint is used to specify the alert type of the active calls - channel 1.
AcallCH1-Addr		1			The setpoint is used to specify the recipient address for the active calls - channel 1. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail).
AcallCH2-Type	0 - DISABLED 1 - DATA-ANA 2 - DATA-GSM 3 - DATA-ISDN 4 - DATA-CDMA 5 - SMS-GSM 6 - SMS-CDMA 7 - IB-E-MAIL 8 - IB-EML-SMS	1	DISABLED		The setpoint is used to specify the alert type of the active calls - channel 2.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
AcallCH2-Addr		1			The setpoint is used to specify the recipient address for the active calls - channel 2. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail).
AcallCH3-Type	0 - DISABLED 1 - DATA-ANA 2 - DATA-GSM 3 - DATA-ISDN 4 - DATA-CDMA 5 - SMS-GSM 6 - SMS-CDMA 7 - IB-E-MAIL 8 - IB-EML-SMS	1	DISABLED		The setpoint is used to specify the alert type of the active calls - channel 3.
AcallCH3-Addr		1			The setpoint is used to specify the recipient address for the active calls - channel 2. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail).
AcallCH4-Type	0 - DISABLED 1 - DATA-ANA 2 - DATA-GSM 3 - DATA-ISDN 4 - DATA-CDMA 5 - SMS-GSM 6 - SMS-CDMA 7 - IB-E-MAIL 8 - IB-EML-SMS	1	DISABLED		The setpoint is used to specify the alert type of the active calls - channel 4.
AcallCH4-Addr		1			The setpoint is used to specify the recipient address for the active calls - channel 4. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail).
AcallCH5-Type	0 - DISABLED 1 - DATA-ANA 2 - DATA-GSM 3 - DATA-ISDN 4 - DATA-CDMA 5 - SMS-GSM 6 - SMS-CDMA 7 - IB-E-MAIL 8 - IB-EML-SMS	1	DISABLED		The setpoint is used to specify the alert type of the active calls - channel 5.
AcallCH5-Addr		1			The setpoint is used to specify the recipient address for the active calls - channel 5. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail).
NumberRings AA	1-30	1	3		This setpoint is used to adjust the number of rings after which the modem, which is attached to he controller, answers the incoming call. Number of rings prior to answering the modem connection from PC to controller. **Note:** Any change of this setpoint is applied first after next switching the controller or modem off and on or after disconnecting the modem from the controller and connecting it back.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
ActCallAttempt	1-250	1	5		This setpoint is used to adjust the maximum number of consequent attempts to perform an active data call. The next attempt is performed 120 s after the previous unsuccessful attempt.
Acall+SMS lang	1-7	1	1		The setpoint specifies in which language the active SMS and e-mail messages are issued. Adjust the setpoint to the index of the required language. The index can be obtained from the tab Languages in GenConfig. Index 1 is always English.

Date/Time

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Time stamp act	0 - DISABLED 1 - ENGINE RUNNING 2 - ALWAYS	1	ENGINE RUNNING		The setpoint selects the Time stamp function mode. **DISABLED** The function is disabled. **ENGINE RUNNING** While the engine is running the Time stamps records are recorded into the history log with period adjusted by setpoint Time Stamp Per. **ALWAYS** The Time stamps records are recorded into the history log with period adjusted by setpoint Time Stamp Per all the time while the controller is switched on.
Time stamp per	1-240 min.	1	15		The setpoint adjusts the time interval for Time stamp records. See also the setpoint Time stamp act.
#SummerTimeMod	0 - DISABLED 1 - WINTER 2 - SUMMER 3 - WINTER-S 4 - SUMMER-S	1	DISABLED		The setpoint is used to select the mode of automatic daylight saving time change. **DISABLED** The automatic change to daylight saving time and back is disabled. **WINTER** The automatic change is enabled, the current season is winter and the controller is located in the northern hemisphere. **SUMMER** The automatic change is enabled, the current season is summer and the controller is located in the northern hemisphere. **WINTER-S** The automatic change is enabled, the current season is winter and the controller is located in the southern hemisphere. **SUMMER-S** The automatic change is enabled, the current season is summer and the controller is located in the southern hemisphere.
PremortHistPer	0 - 100 ms 1 - 300 ms 2 - 500 ms 3 - 1 s 4 - 3 s	3	3 s		Sets the period of time that pre-alarm records are stored memory.
#Time		1	10:08:54 AM (Set to current time)		The setpoint shows the current time from the internal RTC clock of the controller and can be also used to readjust it. **Note:** If the controller is connected to other controllers via the CAN2 bus, the setpoints #Time and #Date are automatically synchronized each hour with the controller that has lowest address. If date/time is changed at one controller it is automatically updated also in all other controllers in the group. **Note:** Setpoint with the symbol # are synchronized between controllers.
#Date		1	5/20/2016 (Set to current date)		The setpoint shows the date from the internal RTC clock of the controller and can be also used to readjust it. **Note:** If the controller is connected to other controllers via the CAN2 bus, the setpoints #Time and #Date are automatically synchronized each hour with the controller that has lowest address. If date/time is changed at one controller it is automatically updated also in all other controllers in the group. **Note:** Setpoint with the symbol # are synchronized between controllers.

Analog Protection

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
HiOilTempWrLim	200–300°F	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 219.2°F **1300REZCK** = 100°C		This setpoint sets the temperature limit for the high oil temperature warning. When the oil temperature exceeds the limit and the time delay expires, an alarm warning is issued.
HiOilTempSdLim	200–300°F	7	224.6		This setpoint sets the temperature limit for the high oil temperature shutdown. When the oil temperature exceeds the limit and the time delay expires, a shutdown alarm is issued and the generator set is shutdown.
HiOilTemp Del	0–600 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 5 **1300REZCK** = 2		This setpoint sets the length of time that the signal must remain above the limit before an action is taken.
LowOilPrsWrLim	20–100 PSI	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 56.5 PSI **1300REZCK** = 390 kPa		This setpoint sets the low oil pressure warning limit. When oil pressure drops below the limit and the time delay expires, a warning alarm is issued.
LowOilPrsSdLim	20–100 PSI	7	52.2		This setpoint sets the low oil pressure shutdown limit. When oil pressure drops below the limit and the time delay expires, a shutdown alarm is issued and the generator set is shutdown.
LowOil PresDel	0–600 s	7	5		This setpoint sets the length of time that oil pressure must remain below the limit before an action is taken.
HiClntTmpWrLim	150–250°F	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 197.6°F **1300REZCK** = 92°C		This setpoint sets the temperature limit for the high coolant temperature warning. When the coolant temperature exceeds the limit, an alarm warning is issued.
HiClntTmpSdLim	150–250°F	7	204.8		This setpoint sets the temperature limit for the high coolant temperature shutdown. When the coolant temperature exceeds the limit, a shutdown alarm is issued and the generator set is shutdown.
CoolntTempDel	0–600 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 5 **1300REZCK** = 2		This setpoint sets the length of time that the coolant temperature signal must remain above the limit before an action is taken.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
LoClntPrsrLim	2–10 PSI	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 7.3 PSI **1300REZCK** = 50 kPa		This setpoint sets the low coolant pressure warning limit. When coolant pressure drops below the limit and the time delay is exceeded, a warning alarm is issued.
CoolntPrssrDel	0–600 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 5 **1300REZCK** = 2		This setpoint sets the length of time that coolant pressure must drop below the limit before an action is taken.
HiAmbTempWrLim	°F	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 86°F **1300REZCK** = 30°C		This setpoint sets the temperature limit for the ambient air temperature warning. When the temperature exceeds the limit and the time delay expires, a warning alarm is issued and the generator rating is decreased.
AmbientTmp Del	0–600 s	7	**400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK** = 5 **1300REZCK** = 2		This setpoint sets the length of time that the ambient air temperature must exceed the limit before an action is taken.
HiFuelMixWrLim	200–250°F	7	208.4		This setpoint sets the temperature limit for the high air-fuel mixture temperature warning. When the air-fuel temperature exceeds the limit and the time delay expires, an alarm warning is issued.
HiFuelMixSdLim	200–250°F	7	212		This setpoint sets the temperature limit for the high air-fuel mixture temperature shutdown. When the air-fuel mixture temperature exceeds the limit and the time delay expires, a shutdown alarm is issued and the generator set is shutdown.
AirFuelMix Del	0–600 s	7	5		This setpoint sets the length of time that the air-fuel mixture signal must remain above the limit before an action is taken.
Batt >V	8–40 V	1	30		This setpoint adjusts the warning level for battery overvoltage alarm.
Batt <V	8–40 V	1	22		This setpoint adjusts the warning level for battery undervoltage alarm.
Batt volt del	0–600 s	1	5		This setpoint sets the length of time that the battery voltage must exceed the over or under limit before an action is taken.
LoClntTempLim	0–100°F	7	**500REZK, 750REZK, 1000REZK** = 50°F **400REZCK, 600REZCK, 800REZCK, 1000REZCK** = 40°F **1300REZCK** = 10°C		This setpoint sets the temperature limit for the low coolant temperature warning. When the coolant temperature is below the limit and the time delay expires, a warning alarm is issued.

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
LoClntTempDel	0–600 s	7	0		This setpoint sets the length of time that the coolant temperature signal must drop below the limit before an action is taken.
Overpower kW	300–1400 kW	7	Nominal power multiplied by a specified percentage (ESP and COP = 102%, PRP = 112%)		This setpoint sets the maximum power that the generator can carry for extended periods of time. The maximum time the generator is allowed to carry this load is 1 minute. After 1 minute, a shutdown alarm is issued and the generator set is shut down. The limit is 102% of rated power for standby and continuous and 112% of rated power for prime. **Note:** For continuous rated generator sets, overpower will result in a warning alarm only, no shutdown.
Overpower Del	0–600 s	7	60		This setpoint sets the length of time that the generator power can exceed the limit before an action is taken.
HiExstTempLim		7	**1300REZCK** = 1500°C (Not applicable for 400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK)		This setpoint sets the exhaust temperature limit for the high exhaust temperature warning. When the exhaust temperature exceeds the limit and the time delay expires, a HiExtTempLim warning is issued.
ExstTempDel		7	2 (Not applicable for 400REZCK, 500REZK, 600REZCK, 750REZK, 800REZCK, 1000REZCK, 1000REZK)		This setpoint sets the length of time that the exhaust temperature must exceed the limit before an action is taken.

PLC

Setpoint	Range Setting	Access Level	Default Selection	User-Defined Settings	Definitions
Fan On Delay	0–3000.0 s	4	30.0		This setpoint sets the length of time, after crank disconnect, that high coolant temperature is ignored for enabling the fan control output.
Fan On Temp	50.0 – 220.0°F (10 – 105°C for the 1300REZCK)	4	150.0°F **1300REZCK** = 65°C		This setpoint sets the coolant temperature limit for the fan on temperature. When the coolant temperature rises above the limit and the time delay expires, the fan output is enabled.
FanOffTmpHystr	1.0 – 40.0°F (1 – 20°C for the 1300REZCK)	4	10.0°F **1300REZCK** = 5°C		This setpoint sets the coolant temperature limit for the fan off temperature as the difference from the turn on value. Turn off is less than the turn on by this amount. When the coolant temperature falls below the Fan On Temp less this amount, the fan output is disabled.
ExhTemp40Prcnt	500–1000°F	6	See the ratings chart.		This setpoint is used to define the nominal high limit for exhaust temperature when the generator is running at or below 40% of rated output. This value, along with ExhTmp100Prcnt, defines the sliding limit for exhaust temperature when generator output is between 40% and 100% of rated output.
ExhTmp100Prcnt	500–1000°F	6	See the ratings chart.		This setpoint is used to define the nominal high limit for exhaust temperature when the generator is running at or above 100% of rated output. This value, along with ExhTmp40Prcnt, defines the sliding limit for exhaust temperature when generator output is between 40% and 100% of rated output.
FaultInitToAut	0 – FALSE 1 – TRUE	0	1, TRUE		This setpoint is used to define operation of the control system when powered up or initialized. When the controller is powered up, the last mode (OFF, AUT, MAN) isused. If in AUT, the generator will start when the remote start contacts are closed. This may be undesirable. To prevent unexpected cranking of the engine, this setpoint can be set to 1 (TRUE) so that a shutdown alarm is issued when the mode is AUT at power up initialization. If the controller is routinely disconnected and reconnected from the battery, it may be acceptable to set this setpoint to 0 (FALSE). **Note:** Unexpected cranking of the engine may occur in AUT mode when set to 0 (FALSE).
LowCrnkBatLim	0–36 V	2	0		This setpoint is used to define the low limit for battery voltage during cranking. If battery voltage falls below this value during cranking, a warning alarm will be issued. This setpoint may be used to determine the status of the cranking battery during cranking and should be set by the user according to the specifications of the battery manufacturer.
GcbFdbkDel	0 – 30.0 s	4	0.5		This setpoint defines the maximum delay between the GCB control output to close or trip the circuit breaker and the feedback indicating the position of the circuit breaker. Failure to detect a change in position when a close or trip signal is provided will result in an alarm.

Notes

Appendix C History Events and Alarms

The tables in this appendix display the alarm types and descriptions of specific alarms and events. Use the alarm types to determine the controller actions for a specific alarm type and use the alarm definitions to find the description of the event and to determine whether the event will be recorded in the event history log, be displayed in the AlarmList, or both.

For engine messages, refer to the CAN communication list in the engine installation manual.

Footnotes

Refer to the following list of footnotes that are referenced in the appendix. These footnotes provide additional information for events and alarms

1. Speed control related regulation loops are part of the Sync/Load ctrl group of setpoints:
   - F**requency regulation loop**: Freq gain, Freq int setpoints
   - **Angle regulation loop**: Angle gain setpoint
   - **Load regulation loop**: Load ramp, Load gain, Load int setpoints
   - **Load sharing loop**: LS gain, LS int setpoints
2. Voltage control related regulation loops are part of the Volt/PF ctrl group of setpoints:
   - **Voltage regulation loop**: Voltage gain, Voltage int setpoints
   - **Power Factor regulation loop**: PF gain, PF int setpoints
   - **VAr sharing regulation loop**: VS gain, VS int setpoints
3. Alarm is related to Generator voltage terminals connection.
4. Alarm is related to Mains (Bus) voltage terminals connection.
5. Alarm is related to Mains (Bus-L) voltage terminals connection.
6. Alarm is related to Bus (Bus-R) voltage terminals connection.
7. Wrong phases sequence means that, for example, generator/Mains voltages rotation is counter clockwise. Typical reason is that two phases are swapped, for example, phase L2 is connected to L3 controller voltage terminal and phase L3 is connected to L2 controller voltage terminal.
8. Adjust setting of incorrectly set setpoints to get rid of the alarm.
9. It happens if 12V battery is used as power supply and voltage drops during engine starting (due to high starter current).
10. Check if generator voltage regulation works properly if this alarm is issued.
11. Check if engine speed regulation works properly if this alarm is issued.
12. Check either mains transformer or generator phases connection, one of transformer or generator phases is connected in the wrong order (swap transformer or generator coil leads connection).

Alarm Definitions

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
AccessCodeChng	H	Controller access code was changed.
AccessCodeSet	H	Controller access code was set.
ActCall Fail	A	Indication of failed Active call.
ActCallCH1-OK, CH2-OK, CH3-OK	H	Indication of successful active call 1-3.
ActCallCH1Fail, CH2Fail, CH3Fail	A+H	Indication of unsuccessful active call 1-3.
Admin action	H	This history record means that user administration changes were done. Only User 0 (Administrator) is allowed to do such changes. These events can be recorded as Admin action record: Password reset. Access rights changed. Alias changed.
AHI NotInAuto	A+H	The controller is not in AUT mode. The alarm appears on the screen and the controller records an event in the history log; but, the horn will not sound.
AHI GenrtrNotReady	A+H	The generator set is not ready for full automatic operation. This alarm generally occurs prior to or during prelube when the generator set is not ready for automatic operation. This alarm will occur if breaker closure is disabled by activation of SynchCheck. The alarm appears on the screen and the controller records an event in the history log; but, the horn will not sound.
AHI SynchCheck	A+H	This alarm indicates that the controller is in test mode for bus synchronization. All aspects of synchronization are tested but the controller does not allow the bus breaker to close. This feature is typically used during commissioning and should be disabled during normal operation. The alarm appears on the screen and the controller records an event in the history log; but, the horn will not sound.
AHI PreLube	A+H	Indicates that the engine is being prelubed for operation. The alarm appears on the screen and the controller records an event in the history log; but, the horn will not sound.
Al/Hist. msg 1-16	A+H	Al/Hist. msg 1-16 activity indication (Al/Hist. msg means Alarm/History message). Al/Hist. msg can be used as a customized message for additional protection configured to any controller internal value.
ANA 1-10	A+H	Indication of error in communication with analog inputs extension module. Check if the unit with corresponding CAN address is: • powered up • address of the module is set correctly • correctly connected and check connection of terminating resistors on the CAN1 bus • the CAN bus Low and High wires are not swapped To check module communication activity look at the Tx and Rx LEDs of the CAN bus port. Fast flashing means that communication is OK.
AOUT 1-4	A+H	Indication of error in communication with analog outputs extension module. Check if the unit with corresponding CAN address is: • powered up • correctly connected and check connection of terminating resistors on the CAN1 bus • the CAN bus Low and High wires are not swapped To check module communication activity look at the Tx and Rx LEDs of the CAN bus port. Fast flashing means that communication is OK.
B L neg[6]	A	Bus phase is inverted[12]
B ph opposed[6]	A	Wrong bus phases sequence[7]
B ph+L neg[6]	A	Wrong bus phases sequence[7], additionally one phase is inverted
Batt volt	A+H	Indication of battery voltage protection activity. This protection is based on **Analog protect**: *Batt >V*, *Batt <V*, and *Batt volt del* setpoints. Check if the battery charger works properly.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
BIN 1-12	A+H	Indication of error in communication with binary inputs extension module. Check if the unit with corresponding CAN address is: • powered up • address of the module is set correctly • correctly connected and check connection of terminating resistors on the CAN1 bus • the CAN bus Low and High wires are not swapped To check module communication activity look at the Tx and Rx LEDs of the CAN bus port. Fast flashing means that communication is OK.
BinaryUnstable	H	Unstable binary input, this problem is usually caused by floating binary input ground. Check controller grounding to fix the problem.
BL L neg[5]	A	Left bus phase is inverted[12]
BL ph opposed[5]	A	Wrong left bus phases sequence[7]
BL ph+L neg[5]	A	Wrong left bus phases sequence[7], additionally one phase is inverted
BOC fgen over	A+H	Generator frequency was over the *Gen >f* limit for *Gen f del* time. Over frequency protection is based on **Gener protect**: *Gen <f* and *Gen f del* setpoints. [11]
BOC fgen under	A+H	Generator frequency was under the *Gen <f* limit for *Gen f del* time. Under frequency protection is based on **Gener protect**: *Gen <f* and *Gen f del* setpoints. [11]
BOC IDMT	A+H	Indicates current IDMT protection activation. Current IDMT protection is inverse definite minimum time protection which is based on the generator current. Protection reaction time depends on overcurrent value. High overcurrent means short reaction time whereas low overcurrent means longer reaction time. Protection is based on setpoints **Generator protect**: *2Inom del* and **Basic settings**: *Nomin current.*
BOC L1, L2 or L3 over	A+H	Generator L1, L2 or L3 voltage was over the *Gen >V BOC* limit for *Gen V del* time. Overvoltage protections are based on **Gener protect**: *Gen >V BOC* and *Gen V del* setpoints. This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL. [10]
BOC L1, L2 or L3 under	A+H	Generator L1, L2 or L3 voltage was under the *Gen <V BOC* limit for *Gen V del* time. Undervoltage protections are based on **Gener protect**: *Gen <V BOC* and *Gen V del* setpoints. This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL. [10]
BOC L12, L23 or L31 over	A+H	Generator L12, L23 or L31 voltage was over the *Gen >V BOC* limit for *Gen V del* time. Overvoltage protections are based on **Gener protect**: *Gen >V BOC* and *Gen V del* setpoints. This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE. [10]
BOC L12, L23 or L31 under	A+H	Generator L12, L23 or L31 voltage was under the *Gen <V BOC* limit for *Gen V del* time. Undervoltage protections are based on **Gener protect**: *Gen <V BOC* and *Gen V del* setpoints. This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE. [10]
BOC NCB fail	A+H	NCB fail is detected if the *NeutralCB fdb* input doesn't follow *Neutral CB C/O* output within 400 ms.
BOC Overload	A+H	Indicates overload IDMT protection activation. Overload IDMT protection is inverse definite minimum time protection which is based on the generator power. Protection reaction time depends on generator power value. High generator overload means short reaction time whereas low generator overload means longer reaction time. Protection is based on setpoints **Generator protect**: OverldStrtEval and 2POverldStEvDel.
BOC ReversePwr	A+H	This alarm is issued by the reverse power protection. This protection is based on **Gener protect**: *Reverse power* and *ReversePwr del* setpoints. This alarm means that either engine speed/power control does not work properly or generator current transformers (CT s) are connected incorrectly. [11]
BOC ShortCurr	A+H	Generator short circuit current protection was activated. Generator current was over **Generator protect**: *Ishort* level for *Ishort del.* time.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
BOR IbusL IDMT	A+H	Indicates current IDMT protection activation. Current IDMT protection is inverse definite minimum time protection which is based on the left bus current. Protection reaction time depends on overcurrent value. High overcurrent means short reaction time whereas low overcurrent means longer reaction time. This protection is active if the *BusL2Inom prot* setpoint is set to ENABLED. Protection is based on setpoints **BusL protect**: *BusL2Inom del* and **Basic settings**: *Nomin current.*
BOR PbusL IDMT	A+H	Indicates overload IDMT protection activation. Overload IDMT protection is inverse definite minimum time protection which is based on the left bus power. Protection reaction time depends on the left bus power value. High left bus overload means short reaction time whereas low left bus overload means longer reaction time. This protection is active if the *BusL2POvrldProt* setpoint is set to ENABLED. Protection is based on setpoints **BusL protect**: *OverldStrtEval* and *2POverldStEvDel*.
BOUT 1-12	A+H	Indication of error in communication with binary outputs extension module. Check if the unit with corresponding CAN address is: • powered up • address of the module is set correctly • correctly connected and check connection of terminating resistors on the CAN1 bus • the CAN bus Low and High wires are not swapped To check module communication activity look at the Tx and Rx LEDs of the CAN bus port. Fast flashing means that communication is OK.
BR L neg[6]	A	Right bus phase is inverted[12].
BR ph opposed[6]	A	Wrong right bus phases sequence[7].
BR ph+L neg[6]	A	Wrong right bus phases sequence[7], additionally one phase is inverted.
BTB closed	H	Bus-tie breaker was closed.
BTB opened	H	Bus-tie breaker was opened.
BTB opened ext	H	Bus-tie breaker was opened externally.
Bus meas error	A+H	Bus measurement error is issued if bus voltage is out of limits.
Bus V unbal	A+H	Bus voltage unbalance alarm is based on **Gener protect (Bus protect)**: *Bus V unbal* and *Bus V unb del* setpoints. The voltage unbalance is calculated as a maximum difference between phase voltages.
BusL f over	H	Left bus frequency was over the *BusLeft >f* limit for *BusLeftf del* time. Over frequency protection is based on **BusL protect**: *BusLeft >f* and *BusLeft f del* setpoints.
BusL f under	H	Left bus frequency was under the *BusLeft <f* limit for *BusLeft f del* time. Under frequency protection is based on **BusL protect**: *BusLeft <f* and *BusLeft f del* setpoints.
BusL I unbal	A+H	Left bus current asymmetry (unbalance) alarm is based on **Gener protect**: *BusL I unbal* and *BusL I unb del* setpoints. The current unbalance is calculated as a maximum difference between phase currents.
BusL L1, L2 or L3 over	H	Left bus L1, L2 or L3 voltage was over the *BusLeft >V* limit for the *BusLeft V del* time. Information about that is recorded into controller history. Setpoint **BusL protect**: *BusL Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be below the *BusLeft >V* limit if BTB synchronization should be started, because the *BusLeft >V* setpoint is used for healthy bus detection (this condition applies only if *BusL Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.
BusL L1, L2 or L3 under	H	Left bus L1, L2 or L3 voltage was under the *BusLeft <V* limit for the *BusLeft V del* time. Information about that is recorded into controller history. Setpoint **BusL protect**: *BusL Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be over the *BusLeft <V* limit if BTB synchronization should be started, because the *BusLeft <V* setpoint is used for healthy bus detection (this condition applies only if *BusL Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
BusL L12, L23 or L31 over	H	Left bus L12, L23 or L31 voltage was over the *BusLeft >V* limit for the *BusLeft V del* time. Information about that is recorded into controller history. Setpoint **BusL protect**: *BusL Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be below the *BusLeft >V* limit if BTB synchronization should be started, because the *BusLeft >V* setpoint is used for healthy bus detection (this condition applies only if *BusL Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.
BusL L12, L23 or L31 under	H	Left bus L12, L23 or L31 voltage was under the *BusLeft <V* limit for the *BusLeft V del* time. Information about that is recorded into controller history. Setpoint **BusL protect**: *BusL Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be over the *BusLeft <V* limit if BTB synchronization should be started, because the *BusLeft <V* setpoint is used for healthy bus detection (this condition applies only if *BusL Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.
BusL V unbal		Left bus voltage unbalance alarm is based on **BusL protect**: *BusL V unbal* and *BusL V unb del* setpoints. The voltage unbalance is calculated as a maximum difference between phase voltages.
BusR f over	H	Right bus frequency was over the *BusRight >f* limit for *BusRight f del* time. Over frequency protection is based on **BusR protect**: *BusRight >f* and *BusRight f del* setpoints.
BusR f under	H	Right bus frequency was under the *BusRight <f* limit for *BusRight f del* time. Under frequency protection is based on **BusR protect**: *BusRight <f* and *BusRight f del* setpoints.
BusR L1, L2 or L3 over	H	Right bus L1, L2 or L3 voltage was over the *BusRight >V* limit for the *BusRight V del* time. Information about that is recorded into controller history. Setpoint **BusR protect**: *BusR Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be below the *BusRight >V* limit if BTB synchronization should be started, because the *BusRight >V* setpoint is used for healthy bus detection (this condition applies only if *BusR Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.
BusR L1, L2 or L3 under	H	Right bus L1, L2 or L3 voltage was under the *BusRight <V* limit for the *BusRight V del* time. Information about that is recorded into controller history. Setpoint **BusR protect**: *BusR Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be over the *BusRight <V* limit if BTB synchronization should be started, because the *BusRight <V* setpoint is used for healthy bus detection (this condition applies only if *BusR Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.
BusR L12, L23 or L31 over	H	Right bus L12, L23 or L31 voltage was over the *BusRight >V* limit for the *BusRight V del* time. Information about that is recorded into controller history. Setpoint **BusR protect**: *BusR Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be below the *BusRight >V* limit if BTB synchronization should be started, because the *BusRight >V* setpoint is used for healthy bus detection (this condition applies only if *BusR Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.
BusR L12, L23 or L31 under	H	Right bus L12, L23 or L31 voltage was under the *BusRight <V* limit for the *BusRight V del* time. Information about that is recorded into controller history. Setpoint **BusR protect**: *BusR Volt prot* has to be set to ENABLED if healthy bus voltage detection and history record are requested. Voltage has to be over the *BusRight <V* limit if BTB synchronization should be started, because the *BusRight <V* setpoint is used for healthy bus detection (this condition applies only if *BusR Volt prot* is set to ENABLED). This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
BusR V unbal		Right bus voltage unbalance alarm is based on **BusR protect**: *BusR V unbal* and *BusR V unb del* setpoints. The voltage unbalance is calculated as a maximum difference between phase voltages.
CAN2 bus empty	A+H	This alarm is active if controller doesn't *see* any other controllers on the CAN2 bus. Alarm activation can be enabled/disabled using setpoint **Comm settings**: CAN2empt*Detect.* This setpoint should be set to DISABLED for single generator set applications. Check Reg16/Reg32 strings to see which controllers are in the same group.
ChrgAlternFail	A+H	Charger fail detection. This alarm means that voltage on the D+ terminal is lower than 80% of controller power supply voltage and it means that battery is no longer charged. Check function of engine alternator or independent battery charger.
Cooling	H	Engine is cooling down
Dongle incomp	A+H	Incompatible (usually missing) dongle indication. A dongle is required if load sharing and power management functions are used in Multiple island applications. A setpoint value is inconsistent with the features supported by the present dongle.
EarthFaultCurr	A+H	Indication of Earth fault current protection activity. This protection is based on **Gener protect**: *EarthFaultCurr* and *EthFltCurr del* setpoints. Setpoint *EarthFltCurrCT* from **Basic settings** group of setpoints is related to this protection too.
ECU	A+H	Indication of error in communication with ECU. Check if the ECU is: • correctly connected to the CAN1 port of the controller • powered up • terminating resistors are properly connected • the CAN bus Low and High wires are not swapped
ECUDiagBlocked	A	Alarm is active when **Comms settings**: *ECU diag* = DISABLED. This setting means that ECU alarms are not displayed and considered by controller and this alarm is the setting notification.
Emerg man	H	Emerg. manual binary input function is active
Emergency stop	A+H	Emergency stop activity indication. Check binary input with Emergency stop function.
ExcitationON/ ExcitationOFF	H	It indicates activation/deactivation of excitation in case of configuration the SUS sequence function.
f bus over	H	Bus frequency was over the *Bus >f* limit for *Bus f del* time. Over frequency protection is based on **Bus protect**: *Bus >f* and *Bus f del* setpoints.
f bus under	H	Bus frequency was under the *Bus <f* limit for *Bus f del* time. Under frequency protection is based on **Bus protect**: *Bus <f* and *Bus f del* setpoints.
Fault reset	H	Indication of the Fault reset function activation. Fault reset function can be activated using the Fault reset button, binary input with FaultResButton function, Modbus or via remote communication.
Fls	A+H	Any alarm with an Fls prefix indicates a sensor failure detection. Check the related sensor connections and verify that the sensor is functioning properly.
ForceValue	H	Indication of any configured ForceValue state.
G L neg[3]	A	Generator phase is inverted. Check generator phases connection, one of generator phases is connected the other way round (swap generator coil leads connection).
G ph opposed[3]	A	Wrong generator phases sequence[7]
G ph+L neg[3]	A	Wrong generator phases sequence[7], additionally one phase is inverted.
GCB closed	H	GCB was closed
GCB opened	H	GCB was opened
Gen I unbal	A+H	Generator current asymmetry (unbalance) alarm is based on **Gener protect**: *Gen I unbal* and *Gen I unb del* setpoints. The current unbalance is calculated as a maximum difference between phase currents.
Gen MF start	H	Indication of generator set start by the Automatic Mains Failure (AMF) function.
Gen MF stop	H	Indication of generator set stop by the Automatic Mains Failure (AMF) function.
Gen Peak start	H	Indication of generator set start by automatic Peak start/stop function. See setpoints **ProcessControl**: *PeakLevelStart*, *PeakLevelStop* and *PeakAutS/S del* for information about this function.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
Gen Peak stop	H	Indication of generator set stop by automatic Peak start/stop function. See setpoints **ProcessControl**: *PeakLevelStart*, *PeakLevelStop* and *PeakAutS/S del* for information about this function.
Gen PMS start	H	Generator set was started by Power Management
Gen PMS stop	H	Generator set was stopped by Power Management
Gen Rem start	H	Indication of generator set start using the Rem start/stop binary input
Gen Rem stop	H	Indication of Gen-set stop using the Rem start/stop binary input
Gen start	H	Indication of generator set start using the Start button
Gen stop	H	Indication of generator set stop using the Stop button
Gen V unbal	A+H	Generator voltage unbalance alarm is based on **Gener protect**: *Gen V unbal* and *Gen V unb del* setpoints. The voltage unbalance is calculated as a maximum difference between phase voltages.
GroupsLinked	H	This history record means that two groups of generator sets were connected together, binary input function *GroupLink* is used for the state indication. Setpoints **Pwr management**: *GroupLinkLeft* and *GroupLinkRight* gives you information which groups of generator sets are in parallel if binary input function *GroupLink* is active.
GroupsUnlinked	H	Binary input function *GroupLink* was deactivated. It means that two groups of generator sets, which were working in parallel, were disconnected from each other.
hist PLC 1-4	H	Default message which indicates activity of PLC functions Force Hist. 1-4.
Idle run	H	Engine was started (*engine started* conditions were fulfilled) and engine speed and generator voltage goes up to nominal values during the Idle run state.
Incom. periph.	A+H	If the incompatible modules are used and the communication to this module cannot be established, this alarm and history event are recorded.
Incorrect password	H	Read information about alarm *PassInsertBlck*.
Load Reconnect	H	Load Shedding function was deactivated and corresponding LdShed stage x output was opened. See description of setpoints in the **Load shedding** group of setpoints.
Load Shed	H	Load Shedding function was activated and corresponding LdShed stage x output was closed. See description of setpoints in the **Load shedding** group of setpoints.
Loaded	H	Generator set is loaded
M L neg[4]	A	Mains phase is inverted. Check mains transformer phases connection, one of transformer phases is connected the other way round (swap transformer coil leads connection).
M ph opposed[4]	A	Wrong mains phases sequence[7]
M ph+L neg[4]	A	Wrong mains phases sequence[7], additionally one phase is inverted
Mains Avg x >V	A+H	If the value of 10 min. average mains voltage of any phase (*Mains Avg V1, Mains Avg V2, Mains Avg V3)* exceed value given by setpoint *Mains Avg >V MP* (*Mains protect* group) the MCB is opened and message *Mains Avg x >V* appears in alarm list and history record. BO *Common MP* is activated (*x indicates number of phase*).
Mains I unbal	A+H	Mains current asymmetry (unbalance) alarm is based on **Mains protect**: *Mains I unbal* and *Mains Iunb del* setpoints. The current unbalance is calculated as a maximum difference between phase currents.
Mains V unbal	A+H	Mains voltage unbalance alarm is based on **Mains protect**: *Mains V unbal* and *MainsV unb del* setpoints. The voltage unbalance is calculated as a maximum difference between phase voltages.
MCB closed	H	MCB was closed
MCB opened	H	MCB was opened
MCB opened ext	H	MCB was opened externally
MGCB closed	H	MGCB was closed
MGCB opened	H	MGCB was opened
MP fmns over	A+H	Mains frequency was over the *Mains >f* limit for *Mains f del* time. Over frequency protection is based on **Mains protect**: *Mains >f* and *Mains f del* setpoints.
MP fmns under	A+H	Mains frequency was under the *Mains <f* limit for *Mains f del* time. Under frequency protection is based on **Mains protect**: *Mains <f* and *Mains f del* setpoints.
MP L1, L2 or L3 over	A+H	Mains L1, L2 or L3 voltage was over the *Mains >V MP* limit for *Mains V del* time. Overvoltage protections are based on **Mains protect**: *Mains >V MP* and *Mains V del* setpoints. This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
MP L1, L2 or L3 under	A+H	Mains L1, L2 or L3 voltage was under the *Mains <V MP* limit for *Mains V del* time. Undervoltage protections are based on **Mains protect**: *Mains <V MP* and *Mains V del* setpoints. This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.
MP L12, L23 or L31 over	A+H	Mains L12, L23 or L31 voltage was over the *Mains >V MP* limit for *Mains V del* time. Overvoltage protections are based on **Mains protect**: *Mains >V MP* and *Mains V del* setpoints. This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.
MP L12, L23 or L31 under	A+H	Mains L12, L23 or L31 voltage was under the *Mains <V MP* limit for *Mains V del* time. Undervoltage protections are based on **Mains protect**: *Mains <V MP* and *Mains V del* setpoints. This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.
MPR Imains IDMT	A+H	Indicates current IDMT protection activation. Current IDMT protection is inverse definite minimum time protection which is based on the mains current. Protection reaction time depends on overcurrent value. High overcurrent means short reaction time whereas low overcurrent means longer reaction time. This protection is active if the *Mns2Inom prot* setpoint is set to ENABLED. Protection is based on setpoints **Mains protect**: *Mains2Inom del* and **Basic settings**: *Nomin current.*
MPR Pmains IDMT	A+H	Indicates overload IDMT protection activation. Overload IDMT protection is inverse definite minimum time protection which is based on the mains power. Protection reaction time depends on mains power value. High mains overload means short reaction time whereas low mains overload means longer reaction time. This protection is active if the *Mns2POvrldProt* setpoint is set to ENABLED. Protection is based on setpoints **Mains protect**: *OverldStrtEval* and *2POverldStEvDel*.
Not lubricated	A	This Alarm list message is active until the first lubrication cycle has been finished.
Not ready	H	Generator set is not ready to start. Controller is either in OFF mode or any 2nd level alarm is in controller alarm list.
OfL StartBlck	A+H	This alarm indicates wrong setpoints setting that disables engine start or load takeover. Incorrect combination of **ProcessControl**: *Island enable; ParallelEnable; Synchro enable; MF start enable* setpoints setting is the reason why this alarm is issued.
OperConflict	A	Alarm alerts to conflict of settings required behavior. It can occur in these cases: • Function MF (MainsFail) want to start gen-set(s), but Insland mode is Disabled (in AUT or TEST mode) • Parallel and Island mode are Disabled (in other mode than OFF) • Parallel is Enabled, but Synchronization is Disabled (NONE) - in AUT mode • This alarm replaces alarm *OfL StartBlck*.
Other CB trip	H	Other circuit breaker on bus was tripped. This information is available for breakers which are controlled by Decision-Maker® 8000 controller.
Over Current Warning	A+H	This alarm indicates that the current in one or more phases has exceeded the threshold set by OvrCrntWrn Lim and exceeded the time limit set by OvrCrntWrn Del. The alarm LED illuminates yellow and the alarm horn sounds when the battery voltage is greater than the overvoltage limit.
Over Current Shutdown	A+H	This alarm indicates that the current in one or more phases has exceeded the threshold set by OvrCrntSd Lim and exceeded the time limit set by OvrCrntSd Del. A Breaker-Open-Cooldown is initiated. The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down. This alarm indicates an auxiliary ground fault from a customer supplied kit.
Overload	H	Gen-set overload protection was activated. See setpoints **Gener protect**: *OverldStrtEval* and *2POverldStEvDel*. Be aware that this protection is based on **Basic settings**: *Nominal power* setpoint setting. **Generator Power (% of Rate Power)** — **Over Load (kW) Trip Curve Time** 200% — 21 Seconds 300% — 7 seconds 500% — 3 seconds 675% — 2 second 850% — 1.5 second
Overspeed	A+H	Gen-set overspeed alarm is based on **Engine protect**: *Overspeed* setpoint setting.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
PassInsertBlck	A	Warning *PassInsertBlck* appears in alarm list when controller is blocked. It is not allowed to insert the password in case that controller is blocked. There is information that controller is blocked for next password attempt and time remaining till the end of location instead of password input window at the terminal screen. The controller is locked for 5 minutes when the password is incorrectly entered 6 times. **Note:** The locked period will increase after every 6 incorrect attempt (if the correct password was not inserted at all) for 30, 60, 120 and 240 minutes. *Incorrect password* message appears in the history of the controller when the invalid password is used ("System Log | Incorrect password").
Password chng	H	Controller password was changed
Password set	H	Controller password was set
Pickup fail	A+H	Pickup fail indication. Pickup fail means loss of RPM signal in running state (*engine running* state is active). *Engine running* conditions: • Engine speed > **Engine params**: *Starting RPM* or • AI: Oil press > *Starting POil* or • D+ terminal active (this condition is used only if **Engine params:** *D+ function* = ENABLED) or • BI: RunIndication 1 or 2 or 3 is active or • Generator voltage > 15V (in any phase)
PLC State 1	A	PLC state 1 indication
PLC State 2	A	PLC state 2 indication
PLC State 3	A	PLC state 3 indication
PLC State 4	A	PLC state 4 indication
Ready	H	Generator set is ready to be started
RevSyncStarted	H	Reverse synchronization was started
ROCOF	H	If the measured value of df/dt (mains frequency) exceeds *ROCOF df/dt* (setpoint in *Mains protect* group), ROCOF protection is activated. ROCOF protection trips mains circuit breaker (MCB). The message *ROCOF* is written in history of controller. Value of df/dt is evaluated from mains voltage.
RTCbatteryFlat	A	This warning message *RTCbatteryFlat* appears in Alarmlist when battery is close to completely flat. If power supply cut comes when the RTC battery is flat, the statistic values, history and setpoints settings are lost. Send the controller to your distributor for battery exchange if *RTCbatteryFlat* message is displayed.
Running	H	Generator set is running and GCB can be closed or synchronization started.
SD AirFuelMixTemp	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because the air-fuel mixture temperature is above 100°C (212°F).
SD Aux Fault	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down. This alarm indicates an auxiliary fault from a customer supplied switch or device.
Sd BatteryFlat	A+H	Alarm is activated if controller *wakes up* after a start attempt which caused battery voltage drop (voltage drop below 6V) and consequently controller switch-off.
SD EGSO2 shutdown	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because of an engine governor error. Check the diagnostic code from the engine governor. Refer to the CAN communication list in the engine installation manual.
SD FuelVlvFail2Cl	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit will not start or crank because the fuel valve failed to close. Verify that the proof-of-closure switch is operating properly.
SD GroundFault	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down. This alarm indicates an auxiliary ground fault from a customer supplied kit.
SD Hi Exhaust1 SD	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because the right exhaust bank temperature is above 815°C (1500°F).
SD Hi Exhaust2 SD	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because the left exhaust bank temperature is above 815°C (1500°F).
SD Hi WaterTempSD	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because the engine jacket water temperature is above 96°C (205°F).
SD HighFuelPress	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because the fuel pressure is too high. Check and measure the fuel pressure, check the high pressure switch setting [should be set to 18 kPa (2.6 psi)], and check the switch wiring.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
Sd L1, L2 or L3 over	A+H	Generator L1, L2 or L3 voltage was over the *Gen >V SD* limit for *Gen V del* time. Overvoltage protections are based on **Gener protect**: *Gen >V SD* and *Gen V del* setpoints. This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings:** *FixVoltProtSel* is set to PHASE-NEUTRAL. [10]
Sd L12, L23 or L31 over	A+H	Generator L12, L23 or L31 voltage was over the *Gen >V SD* limit for *Gen V del* time. Overvoltage protections are based on **Gener protect**: *Gen >V SD* and *Gen V del* setpoints. This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings:** *FixVoltProtSel* is set to PHASE-PHASE. [10]
SD LoOilPresSD	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because the engine oil pressure is below 3.6 Bar (52 psi).
SD Low Oil Level	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because the engine oil level is too low. If oil level is okay, check the condition of the sensor and sensor wiring.
SD LowWaterLevel	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because of a signal from the low coolant level switch. Check the coolant level at the radiator. If the coolant level is okay, check the coolant level switch operation and the switch wiring.
Sd Oil press B	A+H	Engine shut-down was activated by binary input with *Oil press* function.
SD Oil Temp		The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down when the engine oil temperature is above 107°C (225°F).
SD Overload	A+H	Gen-set overload protection was activated. Generator output was greater than 102% (112% if PRP) for more than 1 minute.
SD PreLubeLoPress	A+H	The alarm LED illuminates red, the alarm horn sounds, and the unit shuts down because of low oil pressure during PreLube.
Sd Stop fail	A+H	Engine stop fail indication. Stop fail means that engine does not reach *still engine*. state within **Engine params**: *Stop time*. *Still engine* conditions: • Engine speed (RPM) = 0 and • AI: Oil press < *Starting POil* and • D+ terminal is not active and • BI: RunIndication 1 and 2 and 3 are not active and • Generator voltage < 15V (in all phases) and • Generator frequency = 0 Hz • If all these conditions are fulfilled, additional 2s delay is used to confirm *still engine* state.
SetpointChange	H	Setpoint change indication in controller history. History record contains communication object number of a setpoint which was changed.
SHAIN 1-4	A+H	Indication of error in communication with SHAOUT 1–4 module. Check that: • one of the controllers on site is configured as a SOURCE controller (has SHAOUT (x) module configured) • the SOURCE controller is powered up • TARGET and SOURCE controllers are connected to the CAN2 bus and Tx and Rx LEDs of the CAN2 bus ports are flashing • the controllers can *see* each other – check CAN16/CAN32 values on the Power management screen (each controller is indicated by 1 on the position given by its address) • CAN2 bus connection is correct.
SHAinCfgErr	A	Shared Analog module configuration error – i.e. more than one source module (SHAOUT) were configured (on the CAN2 bus). Make sure that only one SHAOUT x module is configured in controllers.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
SHBIN 1-4	A+H	Indication of error in communication with SHBOUT 1–4 module. Check that • one of the controllers on site is configured as a SOURCE controller (has SHBOUT (x) module configured) • the SOURCE controller is powered up • TARGET and SOURCE controllers are connected to the CAN2 bus and Tx and Rx LEDs of the CAN2 bus ports are flashing • the controllers can *see* each other – check CAN16/CAN32 values on the Power management screen (each controller is indicated by 1 on the position given by its address) • CAN2 bus connection is correct.
SHBinCfgErr	A	Shared Binary module configuration error – i.e. more than one source module (SHBOUT) were configured (on the CAN2 bus). Make sure that only one SHBOUT x module is configured in controllers.
Soft load	H	Generator set load is increased according to **Sync**/**Load ctrl**: *Load ramp*, *Load gain*, *Load int, RampStartLevel* setpoints setting.
Soft unload	H	Generator set load is decreased according to **Sync**/**Load ctrl**: *Load ramp*, *Load gain* and *Load int* setpoints setting. Setpoints **Sync**/**Load ctrl**: *GCB open level* and *GCB open del* are related to generator set unloading too.
Start blocking	A	This message means that a binary input with Startblocking function is active and engine start is blocked. If active, NotReady state is shown on the controller screen and the message appears in the Alarm list. As soon as input is deactivated, engine start is enabled again.
Start fail	A+H	This alarm is issued if generator set start-up fails. It means that several crank attempts has been done (number of attempts is given by **Engine params**: *Crank attempts*) and engine did not start.
StartBlck	A+H	This alarm indicates wrong setpoints setting that disables start of generator sets. Incorrect combination of **ProcessControl**: *Island enable; ParallelEnable; Synchro enable; MF start enable* setpoints setting is the reason why this alarm is issued.
Stp GCB fail	A+H	GCB failure was detected.
Stp Sync fail	A+H	Synchronization failure indication (alarm Sync timeout is active), gen-set or group of generator sets was not synchronized to mains/bus within **Sync**/**Load ctrl**:*Sync timeout* time. Check setting of setpoints in the **Sync**/**Load ctrl** and **Volt**/**PF ctrl** groups. Frequency regulation loop, Angle regulation loop and Voltage regulation loop are active during synchronization and you may need to adjust their setting. Actual state of synchronization is visible on the controller measurement screen with synchroscope where speed and voltage regulators' outputs, slip frequency and generator and mains/bus voltages can be observed during the synchronization process.
SUS seq blck	A	Alarm indicates that SUS sequence is required, but setpoint Gear teeth is equal to 0. (SUS sequence require pick-up sensor for correct function).
Switched On	H	Controller was switched on.
SyncStarted	H	Forward synchronization was started
System	H	These messages may be recorded as *System* reasons: • Firmware prog.error (controller programming error) • Disp.error (problem in communication with controller display) • RTC battery flat (see information about alarm ***RTCbatteryFlat*** in this list) • SetpointCS err (setpoint setting error)[8] • StatisticCS err (statistics value error) • Wrong config (wrong configuration was uploaded into a controller) • Power Fail (controller power supply voltage dropped below 8V) [9]
System Log	H	This history record gives you information that controller history was deleted. This function is part of the Options toolbar.
Terminal	H	External terminal was either connected or disconnected
Time stamp	H	Regular Time stamp record. See setpoints **Date**/**Time**: *Time stamp act* and *Time stamp per*.
TimeModeChange	H	Indication of TimeModeChange (summer/winter). Setpoint **Date**/**Time**: *#SummerTimeMod* is used to do time mode changes.

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
Underspeed	A+H	Generator set under speed alarm indication. Under speed limit is based on **Engine params**:*Starting RPM* setting. This protection is activated after successful engine start if engine speed drops below value given by *Starting RPM* setpoint setting.
Vb L1, L2 or L3 over	H	Bus L1, L2 or L3 voltage was over the *Bus* > *Hst* limit for *Bus V del* time. Overvoltage protections are based on **Bus protect**: *Bus* > *Hst* and *Bus V del* setpoints. This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.
Vb L1, L2 or L3 under	H	Bus L1, L2 or L3 voltage was under the *Bus* < *Hst* limit for *Bus V del* time. Undervoltage protections are based on **Bus protect**: *Bus* < *Hst* and *Bus V del* setpoints. This alarm is issued if voltage protections are based on phase to neutral voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-NEUTRAL.
Vb L12, L23 or L31 under	H	Bus L12, L23 or L31 voltage was under the *Bus* < *Hst* limit for *Bus V del* time. Undervoltage protections are based on **Bus protect**: *Bus* < *Hst* and *Bus V del* setpoints. This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.
Vb L12, L23 or L31 under	H	Bus L12, L23 or L31 voltage was over the *Bus* > *Hst* limit for *Bus V del* time. Overvoltage protections are based on **Bus protect**: *Bus* > *Hst* and *Bus V del* setpoints. This alarm is issued if voltage protections are based on phase to phase voltages. It means that **Basic settings**: *FixVoltProtSel* is set to PHASE-PHASE.
VectorShift	H	Indication of VectorShift protection activation. See setpoints **Mains protect**:*VectorS prot* and *VectorS limit*.
Warming	H	Indication of Warming function activation. In case of operation in parallel with mains is generator set load reduced to *Warming load* level. For more information about this function see setpoints **Engine params:** *Warming load, Warming temp, Max warm time*.
Watchdog	H	Indication of internal watchdog.
WRN AirFuelMixTemp	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the air-fuel mixture temperature is above 96°C (205°F).
WRN AuxWarnAlways	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the binary input is activated (contacts closed). This alarm is activated by a customer supplied switch and may occur at anytime (the alarm does not require the engine to be running).
WRN AuxWarnRunning	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the binary input is activated (contacts closed). This alarm is activated by a customer supplied switch and can only occur while the engine is running.
Wrn BadPwrCfg	A+H	Power format is set differently in controllers which are part of the same control group.
WRN Bat>V	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the battery voltage is greater than the overvoltage limit.
WRN Bat<V	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the battery voltage is less than the undervoltage limit.
WRN BattChargeFail	A+H	The alarm LED illuminates yellow and the alarm horn sounds when a digital input from the battery charger indicates a fault.
Wrn BTB fail	A+H	BTB failure was detected.
Wrn CylTemp1-32	A+H	Warning protection on AI Cylinder temperature 1-32 is active. Check corresponding setpoints in the **Engine protect** group.
WRN Exhaust Delta T	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the difference between exhaust temperature readings is greater than 30°C (54°F)
WRN FuelVlvFail2Op	A+H	The alarm LED illuminates yellow and the alarm horn sounds because the fuel valve failed to open. Issues with the fuel valve may effect the operation of the generator set. Verify that the proof-of-closure switch is operating properly.
WRN Hi Exhaust T1	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the right exhaust bank temperature exceeds the rated temperature at load – consult engine manual for rated temperature versus load.
WRN Hi Exhaust T2	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the left exhaust bank temperature exceeds the rated temperature at load – consult engine manual for rated temperature versus load.
WRN High Oil Level	A+H	The alarm LED illuminates yellow and the alarm horn sounds because of high engine oil level. If oil level is okay, check the condition of the sensor and sensor wiring.
WRN HiWTempWrn	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the engine jacket water temperature is above 92°C (198°F).

Alarm/History Name	Appearance in the AlarmList or History Events Log	Description
WRN Ignition Fault	A+H	The alarm LED illuminates yellow and the alarm horn sounds indicating an engine ignition fault. Check the engine GIS fault code in the AlarmList and refer to the CAN communication list in the engine installation manual.
WRN Low Fuel Press	A+H	The alarm LED illuminates yellow and the alarm horn sounds when low fuel pressure occurs. Check and measure the fuel pressure, check the low pressure switch setting [should be set to 5 kPa (.7 psi)], and check the switch wiring.
WRN LowOilPresWrn	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the engine oil pressure is below 3.9 Bar (56.6 psi) and approaching the shutdown limit.
WRN Low Water Prsr	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the coolant pressure is below 0.5 Bar (7 psi) and approaching the shutdown limit.
WRN LowWaterTemp	A+H	The alarm LED illuminates yellow and the alarm horn sounds when the engine coolant temperature is below 10°C (50°F).
Wrn MCB fail	A+H	MCB failure was detected.
Wrn MGCB fail		MGCB failure was detected.
WRN Oil Temp		The alarm LED illuminates yellow and the alarm horn sounds when the engine high oil temperature is above 104°C (219°F) and approaching the shutdown range.
Wrn RSync fail	A+H	Reverse synchronization failure indication, generator set or group of generator sets was not synchronized to mains within **Sync**/**Load ctrl**:*Sync timeout* time. Check setting of setpoints in the **Sync**/**Load ctrl** and **Volt**/**PF ctrl** groups. Frequency regulation loop, Angle regulation loop and Voltage regulation loop are active during synchronization and you may need to adjust their setting. Actual state of synchronization is visible on the controller measurement screen with synchroscope where speed and voltage regulator's outputs, slip frequency and generator and mains voltages can be observed during the synchronization process.
Wrn SpdRegLim	A+H	This alarm indicates that controller Speed governor output has reached its limit. Warning is issued if Speed governor output stays close to one of the limit values for more than 2 seconds. Close to one of the limits means that Speed governor output value is within *SpeedGovLowLim*+0,2V range or *SpeedGovHiLim*-0,2V range. This alarm gives you information that engine speed governor is either connected incorrectly or one of the speed control related regulation loops[1] is set incorrectly. Warning is blocked if binary output functions SPEED up and SPEED down are configured.
Wrn SUSminPwr	A+H	This warning indicates that required power from the gen-sets with activated LBO: ReadyToExcite was not achieved (require power is set by setpoint #SUS min power).
Wrn Sync fail	A+H	Synchronization failure indication (alarm Sync timeout is active), gen-set or group of generator sets was not synchronized to mains/bus within **Sync**/**Load ctrl**:*Sync timeout* time. Check setting of setpoints in the **Sync**/**Load ctrl** and **Volt**/**PF ctrl** groups. Frequency regulation loop, Angle regulation loop and Voltage regulation loop are active during synchronization and you may need to adjust their setting. Actual state of synchronization is visible on the controller measurement screen with synchroscope where speed and voltage regulators' outputs, slip frequency and generator and mains/bus voltages can be observed during the synchronization process.
Wrn VoltRegLim	A+H	This alarm indicates that controller AVRi output has reached its limit. Warning is issued if the AVRi output stays close to 0% or 100% limit for more than 2 seconds. Close to limit means that AVRi output value is either <2% or >98%. This alarm gives you information that generator voltage regulator is either connected incorrectly or one of the voltage control related regulation loops[2] is set incorrectly. Warning is blocked if binary output functions AVR up or AVR down are configured.
WrnServiceTime	A+H	This alarm is activated when at least one of controller count down service timers **Engine protect**: *Service time X* has reached zero. It is necessary to set again a non-zero value to a corresponding setpoint to reset this alarm.
WrnTstOnLdFail	A+H	This alarm is issued if the Test on load function is activated (by closing corresponding BI) and generator set is not able to take over mains load completely (mains import = 0) within the **Sync**/**Load ctrl**: *Load ramp* time. Message *WrnTstOnLdFail* is recorded into controller history in case of this failure. It is either necessary to extend the *Load ramp* time or check engine speed regulation.[11]
Wrong config	A+H	Wrong controller configuration indication. Indicates that controller hardware doesn't support PLC used in configuration. To check it send the IDch and Dngl strings from controller Info screen 2 and archive to your technical support.

Notes

Appendix D Alarm Types

Alarms are categorized as either a level 1 (yellow) or a level 2 (red) alarm. See Section 2.8 for details.

Alarm Type	Level	Description
Warning	1	• The alarm warning appears in the AlarmList. • The warning is recorded into the history log. • The warning will remain in the AlarmList until it has been acknowledged and deactivated. • The warning activates the output Common Wrn as well as the standard alarm outputs. • A warning will cause the Alarm LED, on the front of the display, to flash. • The Alarm LED flashes until all warnings and alarms are acknowledged. • The Alarm LED remains on steady if there are any acknowledged, active warnings or alarms. • A warning will activate the horn output (any device connected to this output, for example the local audible alarm device). • The horn output will remain active until one of the Horn Reset or Fault Reset functions is activated.
Alarm Only	1	• The alarm appears only in the AlarmList. • The alarm is not recorded into the history log. • The alarm will remain in the AlarmList until it has been acknowledged and deactivated. • The alarm activates the output Common Al as well as the standard alarm outputs. • An alarm will cause the Alarm LED, on the front of the display, to flash. • The alarm LED flashes until all warning and alarms are acknowledged. • The alarm LED remains on steady if there are any acknowledged, active warnings and alarms. • An alarm will activate the horn output (any device connected to this output, for example the local audible alarm device). • The horn output will remain active until one of the Horn Reset or Fault Reset functions is activated.
HistRecOnly	1	• The event is recorded into the history. • Activates the output Common Hst for one second. • Standard alarm outputs are not activated.
AL indication (AlarmList Indication)	1	• The event is only indicated in the AlarmList (no horn). • The alarm disappears from the AlarmList automatically as soon as the cause of the alarms no longer exists. • Standard alarm outputs are not activated.
A+H indication (Alarm and History Indication)	1	• The event is only indicated in the Alarmlist (no horn). • The alarm is recorded in the history log. • It disappear for the AlarmList automatically as soon as the cause of the alarms no longer exists. • Standard alarm outputs are not activated.
Shutdown	2	• The alarm appears in the Alarmlist and is recorded into the history log. • It causes immediate stop of the generator set without unloading and cooling phase. • The generator set can’t be started again while there is a Shutdown alarm in the Alarmlist. • Activates the output Common Sd as well as the standard alarm outputs.
Slow Stop	2	• The alarm appears in the Alarmlist and is recorded into the history log. • It causes stop of the generator set by the standard stop sequence (For example, the unloading and cooling phase). • The generator set can’t be started again while there is a Slow stop alarm in the Alarmlist. • Activates the output Common Stp as well as the standard alarm outputs.

Alarm Type	Level	Description
Off Load	2	• The event appears in the Alarmlist and is recorded into the history log. It does not require confirmation, disappears by itself. • The alarm causes immediate opening of the generator circuit breaker. In AUT modes the generator set remains running for 60 seconds and then it is stopped by the standard stop sequence. In MAN mode the generator set remains running until the operator changes it's operational state manually. • If the controller is in AUT mode and all previously active Off load alarms disappear, the generator set is automatically restarted and connected to the load if the condition for the generator set to be running persists (For example, Rem start/stop is active). • This event is used to put the generator set temporarily off the load for any reason. • Activates the output Common OfL.
Low Power	2	• The event appears in the AlarmList and is recorded in the history log. • It does not require confirmation (disappears by itself). • It causes reduction of the required generator set load to the Min Power PtM during parallel-to-mains operation or local baseload operation. • If all previously active Low power alarms disappeared the generator set is automatically ramped back to the original required load, which is given according to the currently active load control mode (Load ctrl PtM) in PtM operation. • Activates the output Common LoP. • This alarm type is not overridden by the input Sd Override.
BrkOpen&CoolDn	2	• The event appears in the Alarmlist and is recorded into the history log. • It causes immediate opening of the generator circuit breaker (without unloading) and then the standard stop sequence with cooling follows. • The generator set cannot be started again while there is a BOC alarm in the Alarmlist. • Activates the output Common BOC as well as the standard alarm outputs.
Sd Override	2	• The alarm appears in the Alarmlist and is recorded into the history log. • It causes immediate stop of the generator set without unloading and cooling phase. • The generator set cannot be started again while there is a Sd override alarm in the Alarmlist. • Activates the standard alarm outputs. • This alarm type is not overridden by the input Sd Override.

The following tables display the engine, generator, or protection metering. Use this table to find the description for the metering parameter.

Engine Metering

Name	Metering Menu	Description
Oil Temp	AnalogInputs 1	Engine oil temperature.
Oil Pressure	AnalogInputs 1	Engine oil pressure.
Water Temp	AnalogInputs 1	Engine coolant temperature.
LftBankExhaust	AnalogInputs 1	Left bank exhaust outlet temperature.
RitBankExhaust	AnalogInputs 1	Right bank exhaust outlet temperature.
Ambient Air	AnalogInputs 1	Ambient air temperature.
AirFuelMixTemp	AnalogInputs 1	Air-to-fuel mixture temperature.
WaterPressure	AnalogInputs 1	Engine coolant pressure.
Intake Temp	ECU	Engine intake manifold air temperature if available.
MAP 1	ECU	Engine intake manifold air pressure for MAP sensor 1.
MAP 2	ECU	Engine intake manifold air pressure for MAP sensor 2.
PTP 2	ECU	Intake air pressure after compressed by the turbo charger
RPM	Engine values	Engine speed (RPM) at which the engine is presently running.
Run hours	Statistics	Total number of hours of engine operation.
Num starts	Statistics	Engine start commands counter. The counter is increased by 1 even if the particular start command will take more than one attempt.
NumUnscStarts	Statistics	Unsuccessful starts counter. The counter is incremented always when Start fail alarm is issued.
kWhours	Statistics	Active energy counter.
kVArhours	Statistics	Reactive energy counter.
kVAhours	Statistics	Apparent energy counter.

Figure 1 Engine Metering

Generator Metering

Name	Metering Menu	Description
Gen V L1-N	Gener values	Generator voltage in phase L1.
Gen V L2-N	Gener values	Generator voltage in phase L2.
Gen V L3-N	Gener values	Generator voltage in phase L3.
Gen V (avg)	Gener values	Average from all three phases.
Gen V L1-L2	Gener values	Generator voltage between phases L1 and L2.
Gen V L2-L3	Gener values	Generator voltage between phases L2 and L3.
Gen V L3-L1	Gener values	Generator voltage between phases L3 and L1.
Gen freq	Gener values	Frequency (Hz) of alternator output voltage. The frequency is measured in the phase L3.
Gen curr L1	Gener values	Generator current in phase L1.
Gen curr L2	Gener values	Generator current in phase L2.
Gen curr L3	Gener values	Generator current in phase L3.
Gen curr (average)	Gener values	Average generator current for Phases L1, L2, and L3
Act power	Gener values	Total generator active power. (kW)
Act pwr L1	Gener values	Active power in phase L1. (kW)
Act pwr L2	Gener values	Active power in phase L2. (kW)
Act pwr L3	Gener values	Active power in phase L3. (kW)
Actpwrreq	Gener values	Total active power required in phase L1, L2, and L3. (kW)
React power	Gener values	Total reactive power (kVAR).
React pwr L1	Gener values	Reactive power (kVAR) in phase L1.
React pwr L2	Gener values	Reactive power (kVAR) in phase L2.
React pwr L3	Gener values	Reactive power (kVAR) in phase L3.
Appar pwr	Gener values	Total apparent power (kVA).
Appar pwr L1	Gener values	Apparent power (kVA) in phase L1.
Appar pwr L2	Gener values	Apparent power (kVA) in phase L2.
Appar pwr L3	Gener values	Apparent power (kVA) in phase L3.
Pwr factor	Gener values	Total generator power factor.
Pwr factor L1	Gener values	Power factor in phase L1.
Pwr factor L2	Gener values	Power factor in phase L2.
Pwr factor L3	Gener values	Power factor in phase L3.
Gen V unbal	Gener values	Calculated as maximal difference of two phase voltages at one moment and expressed in percentage of the nominal voltage.
Gen I unbal	Gener values	Calculated as maximal difference of two phase currents at one moment and expressed in percentage of the nominal current.
Load char (L, C, R)	Gener values	Character of the generator load. L=Inductor (lagging), C=capacitor (leading), R=Resistor (PF=0)
Load char L1 (L, C, R)	Gener values	Character of the generator load in the L1 phase. L=Inductor (lagging), C=capacitor (leading), R=Resistor (PF=0)
Load char L2 (L, C, R)	Gener values	Character of the generator load in the L2 phase. L=Inductor (lagging), C=capacitor (leading), R=Resistor (PF=0)
Load char L3 (L, C, R)	Gener values	Character of the generator load in the L3 phase. L=Inductor (lagging), C=capacitor (leading), R=Resistor (PF=0)
Slip freq	Gener values	Differential frequency between the generator and the mains/bus.
Angle	Gener values	The angle between the phasors of the generator and mains/bus voltage.
Bus V	Bus values	Average bus voltage from all three phases.
Ubat	Analog CU	Voltage at the controller power supply terminals.
CPU Temp	Analog CU	Temperature inside the controller (on the CPU).
StatLdShed	Load shedding	Load shed stage

Figure 2 Generator Metering

Protective Events

Name	Metering Menu	Description
Overspeed	Engine protect	Engine Overspeed Shutdown. Indicated by high frequency.
Gen >V Sd	Gener protect	Over Voltage Shutdown
Gen >f	Gener protect	Over Frequency Warning
Gen <f	Gener protect	Under Frequency Warning
Hi Oil TempWrn	Analog protect	High Oil Temp Warning
Batt >V	Analog protect	Battery Over Voltage Warning
Batt <V	Analog protect	Battery Under Voltage Warning
Gen V unbal	Gener protect	Generator Voltage Unbalanced Warning
Gen I unbal	Gener protect	Generator Current Unbalanced Warning
Hi Oil Temp SD	Analog protect	High Oil Temp Shutdown
HiWaterTempWrn	Analog protect	High Coolant Temp Warning
Hi WaterTempSD	Analog protect	High Coolant Temp Shutdown
LoWaterTempWrn	Analog protect	Low Coolant Temp Warning
HiAirFuelMixWr	Analog protect	High Air/Fuel Mix Temp Warning
HiAirFuelMixSD	Analog protect	High Air/Fuel Mix Temp Shutdown
Hi Exhaust SD	Analog protect	High Exhaust Temp Shutdown
Derate Active	Analog protect	Derate Active
Overpower kW	Analog protect	Over Power Shutdown
Reverse power	Gener protect	Reverse Power
ExcitationLoss	Gener protect	Reverse Vars / Loss of Excitation
LowOilPress SD	Analog protect	Low Oil Pressure Shutdown
LowOilPressWrn	Analog protect	Low Oil Pressure Warning
WaterPress Yel	Analog protect	Low Water Pressure Warning

Figure 3 Protective Events

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